BY ORDER OF THE
SECRETARY OF THE AIR FORCE

AIR FORCE MANUAL 15-124

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Weather

METEOROLOGICAL CODES

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(CMSgt William M. Scheib)
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This manual implements AFPD 15-1, *Atmospheric and Space Environmental Support,* and the *World Meteorological Organization Aerodrome Forecast Code, FM 51*. It provides encoding and decoding instructions for observing and forecasting codes most commonly used by weather units. It applies to all US Air Force organizations and all Air Force, Department of Defense Air Force civilians, and those personnel providing weather support under contract to the Air Force or its subordinate commands who encode and disseminate Aerodrome Forecast (TAF) for US Air Force and US Army operations. Send comments or suggested changes or improvements through channels to HQ AWS/XOOS, 102 W. Losey St, Room 105, Scott AFB IL 62225-5206. Major commands (MAJCOM), field operating agencies, and direct reporting units send one copy of their supplement to HQ AWS/XOOS and HQ USAF/XOWP; other commands send one copy of each supplement to the next higher headquarters.

SUMMARY OF REVISIONS

This revision incorporates World Meteorological Organization (WMO) mandated changes to the Aerodrome Forecast (TAF) Code (1.2, 4.2). Deletes references to Surface Aviation Observation (SAO) coding conventions, National Weather Service (NWS) Forecast Terminal code , and SAO Pilot Report (PIREP) procedures. Adds NWS TAF (chapter 2), Automated Surface Observing System (4.6) and Aviation Routine Weather Report (METAR) PIREP (chapter 5) coding procedures. Expands and revises US Navy TAF (chapter 3) and Canadian Autostation report procedures (4.5). A ⎪ denotes revision from the previous edition.

Chapter 1

AIR FORCE WEATHER (AFW) AERODROME FORECAST (TAF) CODE

1.1. General Information. This chapter gives instructions for encoding Aerodrome Forecasts (TAF).

1.1.1. Unless otherwise specified, forecast elements in the main body of the forecast text (clouds, weather, wind, etc.) apply to the area within a 5 statute mile (8000 meter) radius of the runway complex.

1.1.2. Forecast elements represent the most probable conditions expected during the forecast period and in the forecast area. Times of occurrence or changes (as indicated by GGGeGe or GG) represent the times conditions are expected to occur.

1.2. Code Format. AFW units issue the TAF code based on World Meteorological Organization Aerodrome Forecast Code, FM 51, and the Aviation Routine Weather Report (METAR) code in AFMAN 15-111. Definitions and coding conventions for construction of w'w' groups (table 1.2) are found in AFMAN 15-111.

1.3. File Times. Major commands (MAJCOM) determine TAF file times for their units and coordinate these times with each unit's servicing automated data weather switch. Units issue TAFs every 6 hours within 15 minutes after file time during forecast service hours, except as noted below:

1.3.1. Limited Duty Stations (LDS) transmit a TAF within 15 minutes after their published forecast service opening time listed in the Department of Defense Flight Information Pamphlet (DoD FLIP). In addition, these stations transmit a TAF during the last scheduled hour of operations if the latest TAF is over 3 hours old and the local control tower remains open.

1.3.2. Forecast agencies and base weather stations (BWS) transmit TAFs for other designated locations as specified by the parent MAJCOM. Include an operational remark, (see paragraph 1.7.7), to indicate limited meteorological watch (met watch) hours during the valid period of the TAF, plus a remotely issued TAF indicator.

1.3.3. Forecast agencies and units normally operating 24 hours a day, who close for a time (i.e., holidays, Army support where entire units deploy to a tactical site) must first coordinate the TAF interruption locally and then inform their respective MAJCOM and the Automated Weather Network (AWN). In addition, these stations must include an operational remark (see paragraph 1.7.7) to indicate metwatch capability during the closure.

1.4. Specification Criteria. Specify in each TAF (scheduled or amended) the time of occurrence to the nearest hour (and or minute as appropriate) the duration, and intensity (where applicable), of expected weather conditions. When using the FMGGgg, the specification will be to the nearest minute (AWDS software does not support use of the FMGGgg group with four digits. Until upgraded, use of FMGG is authorized for AWDS equipped units.) The following weather criteria will be specified in TAFs if expected to occur during the forecast period.

1.4.1. Ceiling or visibility decreases to less than, or if below, increases to equal or exceed:

Ceiling	Visibility
3,000 feet	3 miles (4800 meters)
1,500 feet	2 miles (3200 meters)
1,000 feet	1/2 mile (800 meters)
200 feet	

1.4.1.1. With the exception of centrally produced TAFs, units may substitute the lowest airfield landing minimums for the 200 feet or 1/2 mile categories, or both.

1.4.1.2. Ceiling or visibility decreases to less than, or if below, increases to equal or exceed those values designated locally to be operationally significant.

1.4.1.3. Wind:

1.4.1.3.1. Speed change of 10 knots or more.

1.4.1.3.2. Direction change of greater than 30 degrees when the predominant wind speed (including gusts) is expected to be over 15 knots.

1.4.1.4. Precipitation.

1.4.1.5. Thunderstorms.

1.4.1.6. Icing or turbulence (for Cat II aircraft), not associated with thunderstorms, from the surface to 10,000 feet above mean sea level (MSL). If necessary, base weather station TAFs transmitted into the Automated Weather Network (AWN) may address the area above 10,000 feet MSL provided they coordinate with AFGWC any deviations from an AFGWC icing or turbulence forecast of moderate or greater intensity.

1.4.1.7. Non-convective low level wind shear.

1.4.1.8. Any locally established criteria for weather warnings or weather advisories that can be specified in the TAF.

1.5. Forecast Amendments.

1.5.1. Forecasters will ensure the TAF is representative of expected or actual conditions. Air Force Weather (AFW) units are required to amend the TAF for the criteria in paragraph 1.5.2.

1.5.1.1. Forecasters may amend the TAF anytime they consider it advisable in the interest of safety, efficiency of aircraft operations, flight planning, operational control, or in-flight assistance to aircraft to ensure the forecast is representative of actual or forecast conditions.

1.5.1.2. Forecasters will amend the TAF:

1.5.1.2.1. Anytime an unforecast change is expected to occur and is expected to last more than 30 minutes and is not correctly forecast by the next whole hour.

1.5.1.2.2. Anytime an unforecast change occurs, is expected to last at least 30 minutes and is not forecast by the next whole hour from the time of occurrence (e.g., if the time is 2147Z, the next whole hour is 2200Z, not 2300Z.)

1.5.1.2.3. Anytime a forecast condition does not occur by the specified hour and is not expected to occur within the next 30 minutes. For example, a BECMG 2122 (or BECMG 2022) group would require an amendment if the forecast change occurred before 2030Z or after 2229Z.

1.5.1.2.4. Anytime a temporary (TEMPO) group becomes predominant or is not expected to occur.

1.5.1.3. Local amendments do not need to be transmitted longline unless they meet Air Force standard amendment criteria.

1.5.2. AFW Amendment Criteria:

1.5.2.1. Ceiling or visibility's are observed or later forecast to increase to or exceed, or decrease to less than any of the following values:

Ceiling/Visibility.

3,000 feet/3 statute miles (4800 meters).

1,000 feet/2 statute miles (3200 meters).

200 feet/1/2 statute mile (800 meters).

1.5.2.2. With the exception of centrally produced TAFs, units may substitute the lowest landing minimums for the 200 feet or 1/2 mile categories, or both.

1.5.2.3. Surface Winds:

1.5.2.3.1. The difference between the predominant wind speed (or gust) and the forecast wind speed (or gust) is 10 knots or more. For example, a forecast of 23018G25KT must be amended if observed predominant wind speed is 28 knots or more, or if observed gusts are 35 knots or higher. Similarly, amend the TAF if predominant winds are 8 knots or less, or gusts are 15 knots or less.

1.5.2.3.2. Direction change greater than 30 degrees when the predominant wind speed or gusts are expected to be over 15 knots.

1.5.2.4. Precipitation when:

1.5.2.4.1. Unforecast freezing precipitation begins or ends.

1.5.2.4.2. The beginning or ending of precipitation causing local weather warning or weather advisory that can be specified in the TAF to be issued, canceled, or amended.

1.5.2.4.3. The forecaster considers the occurrence or nonoccurrence of precipitation to be operationally significant.

1.5.2.5. Turbulence and Icing. The beginning or ending of turbulence or icing, not associated with thunderstorms, from surface to 10,000 feet (MSL) which first meets, exceeds, or decreases below moderate or greater thresholds (for CAT II aircraft) and was not specified in the forecast.

1.5.2.6. Non-convective low level wind shear:

1.5.2.6.1. Is occurring and is expected to continue, or is expected to begin, but is not specified in the forecast.

1.5.2.6.2. Is forecast in the TAF, but is not expected to occur during the forecast period.

1.5.2.7. Weather warning and/or TAF amendable weather advisory criteria:

1.5.2.7.1. Occur, or are expected to occur, during the forecast period, but were not specified in the forecast.

1.5.2.7.2. Were specified in the forecast, but are no longer occurring or expected to occur during the forecast period.

1.6. Disseminating TAFs.

1.6.1. Locally. Enter TAFs (including amendments and corrections) into the local dissemination system in the format determined locally.

1.6.2. Longline. Enter TAFs (including amendments and corrections) into the AWN.

1.7. Encoding Instructions.

1.7.1. TAF Code Format:

NOTES:

1. The temperature group is entered only when required by MAJCOM or higher headquarters.

2. The icing and/or turbulence group is entered only when required by paragraphs 1.7.3.7. and 1.7.3.8.

3. The limited forecast service indicator remark is required for each unit that transmits remotely issued TAFs.

4. AWDS software does not currently support placement of the $WSh_xh_xh_x$/dddfffKT or WSCONDS group in the body of the forecast. AWDS equipped units may place the $WSh_xh_xh_x$/dddfffKT or WSCONDS in the remarks section until the software is upgraded.

MESSAGE HEADING

CCCC TAF (AMD or COR or RTD) YYG1G1G2G2 dddffGf_mf_mKT VVVV w'w' NsNsNshshshsCC or VVhshshs or SKC ($WSh_xh_xh_x$/dddfffKT or WSCONDS) ($6I_ch_iih_ih_itL$) ($5Bh_Bh_Bh_Bt_L$) QNHP1P1P1P1INS (Remarks) T(M)T_FT_F/G_FG_FZ GGGeGe or TTGG AMD/COR GGgg (Limited Forecast Service Indicator) (FNXXT/QCYY).

1.7.2. The following is an example AFW TAF for Scott AFB IL with explanations and definitions of the code format.

KBLV TAF 011616 03008KT 0800 PRFG FEW000 BKN005 BKN012 QNH3001INS FG FEW000

TEMPO 1821 14012G18KT 3200 -SN -BLSN FEW000 OVC006 620065 SN FEW000

FM2146 15012G20KT 9999 NSW SCT030 QNH2992INS

BECMG 2324 15012G20KT 3200 -SN -BLSN FEW000 OVC004 620046 QNH2983INS SN FEW000

TEMPO 0103 13015G25KT 0200 -FZDZ FG VV001 650002;

1.7.2.1. The forecast is for Scott AFB IL KBLV, valid from 011600Z to 021600Z. The initial condition (1600Z to 2400Z) is for winds from 030 degrees at 8 knots, visibility 800 meters in fog,

sky cover is few (either a surface based partial obscuration or a layer lower than 50 feet), sky is broken (ceiling) at 500 feet and 1,200 feet. The lowest altimeter setting between 011600Z and 012146Z will be 30.01 inches. There is a fog-induced surface based partial obscuration of from 1/8th to 2/8ths in coverage. Between 1800Z and 2100Z, conditions will vary temporarily (frequently but for short periods) to winds from 140 degrees at 12 knots gusting to 18 knots, visibility 3,200 meters in light snow and light blowing snow, sky cover is few (either a surface based partial obscuration or a layer lower than 50 feet), overcast at 600 feet (the ceiling), the light rime icing from 600 to 5,600 feet AGL. There is a snow-induced surface based partial obscuration of from a 1/8th to 2/8ths in coverage. Beginning at 2146Z conditions will change to wind from 150 degrees at 12 knots gusting to 20 knots, visibility greater than 9,000 meters, no significant weather, sky cover scattered at 3,000 feet and the minimum altimeter setting from 012146Z until 012400Z will be 29.92 inches. Between 012300Z and 012400Z conditions will change gradually to wind from 150 degrees at 12 knots gusting to 20 knots, visibility 3,200 meters in light snow and light blowing snow, sky cover is few (either a surface based partial obscuration or a layer lower than 50 feet), sky is overcast at 400 feet (light rime icing from 400 to 6,400 feet AGL; the lowest altimeter setting from 020000Z until 021600Z will be 29.83 inches). There is a snow-induced surface based partial obscuration from 1/8th to 2/8ths in coverage. Between 0100Z and 0300Z will vary intermittently to winds from 130 degrees at 15 knots gusting to 25 knots, visibility 200 meters with light freezing drizzle and fog, sky totally obscured with vertical visibility 100 feet, and moderate icing in cloud (rime) from surface to 2,000 feet AGL.

1.7.2.2. Example of a corrected (COR) forecast for Ramstein AB, Germany:

ETAR TAF COR 011515 28012G25KT 8000 -RASN SCT006 BKN015 OVC020 620208 540009 QNH2960INS

BECMG 1819 27012KT 9999 NSW SCT015 BKN020 620208 540009 QNH2965INS COR 1615.

Forecast is for Ramstein AB, Germany (ETAR), valid from 1500Z to 1500Z. The initial condition (1500Z to 1900Z) is for winds from 280 degrees at 12 knots gusting to 25 knots, visibility 8,000 meters in light rain and snow, sky cover is scattered at 600 feet, broken at 1,500 feet, and overcast at 2,000 feet. There will be light rime icing in cloud between 2,000 and 10,000 feet AGL and light to moderate turbulence from surface to 9,000 feet AGL. Lowest altimeter setting will be 29.60 inches. Between 1800Z and 1900Z the initial condition will change gradually to winds from 270 degrees at 12 knots, visibility more than 9,000 meters, no significant weather, sky cover scattered at 1,500 feet and broken at 2,000 feet. Icing and turbulence will remain as forecast by the initial condition, and the lowest altimeter setting from 1900Z to 1500Z will be 29.65 inches. This is a corrected forecast, with the correction issued at 1615Z.

1.7.3. Specification of Symbolic Letters :

1.7.3.1. Message Heading. The message heading consists of:

1.7.3.1.1. Location identifier (CCCC).

1.7.3.1.2. Message identifier of "TAF".

1.7.3.1.3. Modifiers as required.

1.7.3.1.3.1. AMD. Modifier for an amended TAF.

1.7.3.1.3.2. COR. Modifier for a corrected TAF.

1.7.3.1.3.3. RTD. Modifier for a TAF filed past its schedule time.

1.7.3.1.4. Valid period (YYG1G1G2G2). The valid period consists of the current date and the 24 hour period of the forecast, except for amended TAFs. Amended TAFs are valid from the current hour (e.g., if the current time is 1640Z, the current hour is 16Z; if the current time is 2110Z, the current hour is 21Z) until the end of the original TAF (e.g., if the 031818Z TAF is amended at 2131Z, the valid period is 032118Z).

1.7.3.2. dddff$G f_m f_m$KT. Surface wind direction, speed and gusts, if any.

1.7.3.2.1. ddd. Forecast true wind direction (from which wind is blowing) to the nearest 10 degrees. If direction will vary more than 60 degrees, encode the prevailing direction for ddd and append the limits of variability to remarks; e.g., "WND 270V350." Although a direction should be forecast whenever one can be determined, there may be situations in which a prevailing direction cannot be forecast; in these rare cases, "VRB" may be encoded for ddd.

1.7.3.2.1.1. When wind speed will be 6 knots or less and a direction cannot be determined, encode dddff as "VRBff" or "00000KT" (calm) as appropriate.

1.7.3.2.1.2. When wind speed will be more than 6 knots, do not use "VRB" for ddd unless the situation involves air mass thunderstorm activity during which a prevailing wind direction cannot be forecast with confidence. When it is possible to forecast the peak gust direction, but not the prevailing direction, encode the wind group as "VRBff$G f_m f_m$KT " and append the probable peak gust direction to remarks; e.g. GUST DRCTN 250.'

1.7.3.2.2. ff. Mean forecast wind speed in whole knots. When speed will be 100 knots or more, use three digits.

1.7.3.2.3. $G f_m f_m$. Forecast speed or gusts, in whole knots. Encode gusts when they will exceed a mean speed (ff) of 10 knots or more by 5 knots or more. Encode gusts of 100 knots or more in three digits.

1.7.3.2.4. Squall. When a squall (SQ) is forecast as a weather phenomena (table 1.2), ensure the forecast wind speed and gust meet squall definition criteria (see attachment 1.)

1.7.3.2.5. KT. Units indicator for wind speed.

1.7.3.3. VVVV. Forecast prevailing visibility in meters, rounded down to the nearest reportable value from table 1.1. Include weather and or an obscuration (as w'w') whenever visibility is forecast as 9 km (9,000 meters) or less.

1.7.3.4. w'w'. Forecast weather and obscuration definitions for construction of w'w' groups (table 1.2) are found in AFMAN 15-111.

1.7.3.4.1. Only one w'w' group is normally included in any one forecast period unless one group will not adequately describe the forecast situation. In questionable cases, select the most significant to aircraft operations; however, FC (Funnel Cloud) takes precedence over all codes. The w'w' groups will be constructed by considering table 1.2 columns 1 to 5 in sequence, that is; intensity/proximity, followed by descriptor, followed by weather phenomena. An example would be : +SHRA (heavy showers of rain).

Table 1.1. Visibility (VVVV).

Statute Miles	Meters	Nautical Miles
0	0000	0.00
1/16	0100	0.05
1/8	0200	0.10
3/16	0300	0.15
1/4	0400	0.20
5/16	0500	0.25
3/8	0600	0.30
	0700	0.40
1/2	0800	0.45
-	0900	0.50
5/8	1000	0.55
-	1100	0.60
3/4	1200	--
-	1300	0.70
7/8	1400	--
-	1500	0.80
1	1600	--
-	1700	0.90
1 1/8	1800	1.00
1 1/4	2000	1.10
1 3/8	2200	1.2
1 1/2	2400	1.3
1 5/8	2600	1.4
1 3/4	2800	1.5
1 7/8	3000	1.6
2	3200	1.7
-	3400	1.8
2 1/4	3600	1.9
-	3700	2.0
2 1/2	4000	2.2
2 3/4	4400	-
-	4500	2.4
-	4700	2.5
3	4800	2.6
-	5000	2.7

Statute Miles	Meters	Nautical Miles
4	6000	3.0
-	7000	4.0
5	8000	4.3
6	9000	5.0
7 and above	9999	6.0 and above

Table 1.2. Weather (w'w') Group Code.

QUALIFIER		WEATHER PHENOMENA		
INTENSITY OR PROXIMITY	**DESCRIPTOR**	**PRECIPITATION**	**OBSCURATION**	**OTHER**
1	**2**	**3**	**4**	**5**
- Light	**MI** Shallow	**DZ** Drizzle	**BR** Mist	**PO** Well-Developed Dust/Sand Whirls
Moderate	**PR** Partial (covering part of the aerodrome)	**RA** Rain	**FG** Fog	**SQ** Squalls
+ Heavy	**BC** Patches	**SN** Snow	**FU** Smoke	**FC** Funnel cloud(s) (Tornado or Waterspout)
(well-developed in the case of dust/ sand whirls, dust devils and tornadoes/waterspouts)	**DR** Low Drifting	**SG** Snow Grains	**VA** Volcanic Ash	**SS** Sandstorm
VC In the Vicinity	**BL** Blowing	**IC** Ice Crystals (Diamond Dust)	**DU** Widespread Dust	**DS** Duststorm
	SH Shower(s)	**PE** Ice Pellets	**SA** Sand	
	TS Thunderstorm	**GR** Hail	**HZ** Haze	
	FZ Freezing (Supercooled)	**GS** Small Hail and/ or Snow Pellets	**PY** Spray	

1.7.3.4.2. When a predominant forecast condition with an encoded w'w' is followed by a change group (BECMG or FM) without w'w' encode the change group's w'w' as "NSW" (no significant weather) to indicate the change.

1.7.3.5. NsNsNshshshsCC. Cloud layer group. Report as often as necessary to indicate all forecast cloud layers. Arrange groups in ascending order of cloud bases (i.e., lowest base first). Encode "SKC" to forecast clear skies.

1.7.3.5.1. NsNsNs. The cloud amount will be given as sky clear (no clouds), few (trace to 2 oktas), scattered (3 to 4 oktas), broken (5 to 7 oktas), or overcast (8 oktas), using the three-letter abbreviations SKC, FEW, SCT, BKN, and OVC followed, without a space, by the height of the base of the cloud layer (mass) hshshs. The summation principle applies. This principle states that the sky cover at any level is equal to the summation of the sky cover of the lowest layer plus the additional sky cover at all successively higher layers up to and including the layer being considered. No layer can be assigned a sky cover less than a lower layer.

1.7.3.5.1.1. When the sky will be totally obscured, encode VVhshshs, where VV is the indicator and hshshs is the vertical visibility in hundreds of feet.

1.7.3.5.2. Ceiling Height. A ceiling is defined as the height above the earth's surface of the lowest layer reported as broken or overcast; or the vertical visibility into an indefinite ceiling. All layers and obscuring phenomena are considered to be opaque. Therefore, a ceiling remark in the TAF is not needed.

1.7.3.5.3. Indefinite Ceiling.($VVh_sh_sh_s$). The vertical visibility, measured in feet, into a surface based total obscuration which hides the entire celestial dome (8/8ths).

1.7.3.5.4. Surface Based Partial Obscuration. When forecasting a surface based partial obscuration, code as FEW000, SCT000, or BKN000, as appropriate to indicate a surface based partial obscuration. Code as a remark the obscuring phenomena and the applicable layer. For example, "FG SCT000" would indicate the w'w' weather element causing the obscuration is caused by fog and layer amount is SCT. Include the amount of partial obscuration in your sky cover summation computation.

1.7.3.5.5. Variable Sky Condition. If two or more significant sky conditions will alternate frequently from one to the other, describe the situation with a TEMPO group; do not use "variable" sky condition remarks.

1.7.3.5.6. hshshs. Forecast height (AGL) of cloud base to the nearest 100 feet from surface to 5,000 feet; to the nearest 500 feet between 5,001 and 10,000 feet; and to the nearest 1,000 feet above 10,000 feet.

1.7.3.5.7. CC. Cloud type. The only cloud type included in the forecast is Cumulonimbus. Append "CB" anytime you expect Cumulonimbus clouds.

1.7.3.6. CAVOK. CAVOK is not used by any US stations issuing TAFs. The definition is given for information only. CAVOK is encoded in place of VVVV, w'w', and NsNsNshshshs when the following are forecast to occur simultaneously

1.7.3.6.1. Visibility, 10 kilometers or more.

1.7.3.6.2. No clouds below 5,000 feet or below the highest minimum sector altitude, whichever is greater, and no Cumulonimbus.

1.7.3.6.3. No precipitation, thunderstorms, duststorm, sandstorm, shallow fog, or low drifting dust, sand, or snow.

1.7.3.7. 6IchihihitL. Forecast icing group, used to forecast icing not associated with thunderstorms (thunderstorm forecasts already imply moderate or greater icing). Repeat as necessary to indicate multiple icing layers. Omit when no icing is forecast.

1.7.3.7.1. 6. Icing Indicator.

1.7.3.7.2. Ic. Type of icing from table 1.4. When more than one type is expected, encode the highest code figure.

1.7.3.7.3. hihihi. Height of the icing layer's base in hundreds of feet AGL (table 1.3).

1.7.3.7.4. tL. Thickness of icing layer in thousands of feet from table 1.5. When a layer is forecast to be thicker than 9,000 feet, repeat the icing group so that the base of the layer expressed by the second group coincides with the top of the layer given by the first.

1.7.3.8. 5BhBhBhBtL. Forecast turbulence group, used only to forecast turbulence not associated with a thunderstorm (thunderstorms already imply severe or extreme turbulence). Omit when no turbulence is forecast.

1.7.3.8.1. 5. Turbulence Indicator.

1.7.3.8.2. B. Turbulence type and intensity from table 1.6.

1.7.3.8.3. hBhBhB. Forecast height of the turbulence layer in hundreds of feet AGL (table 1.3).

1.7.3.8.4. tL. Thickness of the turbulence layer in thousands of feet AGL from table 1.5. When a layer is forecast to be thicker than 9,000 feet, repeat the turbulence group so that the base of the layer expressed by the second group coincides with the top of the layer given by the first.

NOTE:

Icing or turbulence forecasts are for phenomena not associated with thunderstorm activity, from surface to 10,000 feet (MSL) for category II aircraft. Station forecasters may address the areas above 10,000 feet (MSL) provided they coordinate with AFGWC at DSN 271-5742 (priorities permitting), any deviations from AFGWC forecast of moderate or greater intensity.

Table 1.3. Height of Lowest Level of Turbulence (hBhBhB) and Lowest Level of Icing (hihihi).

Code		**Height**
Figure	**Meters**	**Feet**
000	<30	<100
001	30	100
002	60	200
003	90	300
004	120	400
005	150	500
006	180	600
007	210	700

Code Figure	Height Meters	Feet
008	240	800
009	270	900
010	300	1,000
011	330	1,100
etc.	etc.	etc.
099	2,970	9,900
100	3,000	10,000
110	3,300	11,000
120	3,600	12,000
etc.	etc.	etc.
990	29,700	99,000
999	30,000 or more	100,000 or more

Table 1.4. AFW Icing Type (Ic).

Code Figure	Type of Icing
0	No icing
1	Light icing (mixed)
2	Light icing in cloud (RIME)
3	Light icing in precipitation (clear)
4	Moderate icing (mixed)
5	Moderate icing in cloud (RIME)
6	Moderate icing in precipitation (clear)
7	Severe icing (mixed)
8	Severe icing in cloud (RIME)
9	Severe icing in precipitation (clear)

Table 1.5. Thickness of Turbulence and Icing Layers (tL).

Code Figure	Thickness
1	1,000 feet
2	2,000 feet
3	3,000 feet
4	4,000 feet
5	5,000 feet
6	6,000 feet
7	7,000 feet

Code Figure	Thickness
8	8,000 feet
9	9,000 feet

Table 1.6. Turbulence Type and Intensity (B).

Code Figure	Turbulence Type and Intensity
0	None
1	Light Turbulence
2	Moderate Turbulence in clear air, occasional
3	Moderate Turbulence in clear air, frequent
4	Moderate Turbulence in cloud, occasional
5	Moderate Turbulence in cloud, frequent
6	Severe Turbulence in clear air, occasional
7	Severe Turbulence in clear air, frequent
8	Severe Turbulence in cloud, occasional
9	Severe Turbulence in cloud, frequent
X	Extreme Turbulence
Occasional:	Occurring less than 1/3 of the time

1.7.3.9. QNHP1P1P1P1INS. Lowest altimeter setting expected (in inches) during the initial forecast period and in each Becoming (BECMG) and From (FM) change group. Do not include QNH in Temporary (TEMPO) groups.

1.7.3.9.1. QNH. Altimeter setting indicator.

1.7.3.9.2. P2P2P2P2. Forecast lowest altimeter setting.

1.7.3.9.3. INS. Units indicator.

1.7.4. TAF Remarks : For weather and obscurations use the alphabetic abbreviations in table 1.2. Use FAAH 3410, Contractions, for all others. Relate operationally significant forecast elements to geographical features whenever possible; e.g., "FG OVR RIVER E". Start-end times for conditions described in remarks are permitted; e.g., "SHRA OMTNS E 14-19". Do not add a Z to these times; to do so will result in computer confusion with change groups. Take care to ensure that start-end times cannot be confused with other numerical values. Do not use the terms "OCNL," "VC" or "CB" in remarks.

1.7.4.1. The remarks section will not be used as a substitute for a BECMG or TEMPO group.

1.7.4.2. Remarks Order of Entry. Use the following order of entry for remarks:

1.7.4.2.1. Non-Convective Low-Level Wind Shear. Low-level (up to 2,000 feet AGL) wind shear ($WSh_xh_xh_x$/dddfffKT) is a potentially hazardous problem for aircraft preparing for approach to or take-off from airports. Wind shear is of particular concern in North America. Forecasts of non-convective wind shear should be included on an as needed basis, to focus the

attention of the pilot on wind shear problems, existing or expected. To indicate wind shear when complete information can not be reliably forecast with high confidence (usually beyond six hours), use WSCONDS. Omit this group when no low level wind shear is forecast. A wind shear forecast should be included, as indicated below, whenever:

1.7.4.2.1.1. PIREPs, of shear within 2,000 feet of the surface, at or in the vicinity of the TAF airport, causing an indicated air speed loss or gain of 10 knots or more are received, AND the forecaster determines that the reports reflect a valid low level wind shear event rather than mechanical turbulence due to strong surface winds; or

1.7.4.2.1.2. When vertical shears of 10 knots or more per 100 feet in a layer more than 200 feet thick are expected or reliably reported within 2,000 feet of the surface at or in the vicinity of the airport.

1.7.4.2.1.3. The first, and perhaps best, tool for detecting or observing wind shear are the Velocity Azimuth Display (VAD) wind profiles from the WSR-88D. The VAD wind profiles should be helpful in forecasting wind shear in the short term. Low-level wind shear forecasts will be issued in the following format:

$WSh_xh_xh_x$/dddffKT, where:

WS	=	an indicator meaning wind shear;
$h_xh_xh_x$	=	height at which the wind shear threshold is reached;
ddd	=	direction, degrees true, of the forecast wind above the indicated height;
ff	=	speed, in knots, of the forecast wind above the indicated height; and
KT	=	a units indicator, meaning knots

Example:

CCCC 192251Z 200024 21006KT 9999 2FEW020 QNH2992INS WS015/30035KT etc.=

1.7.4.2.2. Surface based partial obscuration. See paragraph 1.7.3.5.4.

1.7.4.2.3. Forecast Surface Temperature Group $T(M)T_FT_F/G_FG_FZ$. This group (included only when required by MAJCOM) provides a mechanism to forecast a two digit temperature (T_FT_F, whole degrees Celsius) in the TAF code for specific times. One or more such groups may be used to give, for example, forecast temperatures at certain times or to indicate expected maximum temperatures and the forecast time of occurrence. To explain the code: T is an indicator, meaning "temperature"; T_FT_F is symbolic for the forecast temperature in whole degrees Celsius (C); G_FG_F is symbolic for the valid time to the nearest whole hour UTC of the temperature forecast; and Z is an abbreviated symbol meaning Universal Coordinated Time (UTC). Precede temperatures between +9°C and -9°C with a 0; precede temperatures below 0°C by the letter M (for minus).

Examples:

T17/20Z - forecast temperature of 17°C at 2000Z

T08/21Z - forecast temperature of 8°C at 2100Z

T00/18Z - forecast temperature of 0°C at 1800Z

TM09/07Z - forecast temperature of minus 9°C at 0700Z

1.7.4.2.4. DENEB. Stations with a fog dispersal capability, include in remarks, "DENEB" and a statement of expected dispersal results (i.e., post dispersal ceiling and visibility) whenever the forecast text includes visibility restrictions

due to fog; e.g., "DENEB SCT010 4800 BR". The main text of the TAF will reflect expected conditions without regard to dispersal activities.

1.7.5. Change Groups . Use BECMG GGGeGe, TEMPO GGGeGe, and FMGGgg Change Groups (AWDS software does not support use of the FM group with four digits. Until upgraded, use of FMGG is authorized for AWDS equipped units.) Use these groups to indicate changes from the predominant forecast condition at some intermediate hour time (GG) or during a specified period between hours (GG to GeGe). TEMPO groups may be used to forecast a change in any or all forecast groups and will be followed by a description of all the elements (except QNH) for which a change is forecast to occur intermittently from GG to GeGe. FM change groups must include all encoded elements. Start a new line of text for each change group. Use change groups wisely, never as a hedge. Several change groups may be encoded to properly identify the forecast conditions. To keep the forecast intent clear and unambiguous, the use of change groups should be done with care and kept to significant changes which are operationally significant to airfield operations. Overlapping of forecast periods should be avoided. Use caution when utilizing too many BECMG and TEMPO change groups between FMGGgg groups. In order to avoid confusion, keep the intent of the forecast simple.

1.7.5.1. FMGGgg. The time indicator TTGG in the form of "FMGGgg" shall be used to indicate the beginning of a self-contained part of the forecast indicated by the four-digit hour and minutes in "GGgg" (AWDS software does not support use of the FM group with four digits. Until upgraded, use of FMGG is authorized for AWDS equipped units.) When the group FMGGgg is used, all forecast conditions preceding this group are superseded by the condition forecast in this group. This forecast line shall contain all elements of a predominant forecast line. For example, if the TAF period is 011212 and a change is forecast at 1420 UTC, the entry "FM1420" shall be encoded. The elements entered on this line are in effect from 1420 UTC to the end of the forecast period, 021200 UTC. While the use of a four-digit time in whole hours, e.g., 1600, remains acceptable, a forecast and amending events may require a higher time resolution. In this case, forecast minutes should be used. Four-digit (to the nearest minute) resolution will only be used in the FMGGgg group.

1.7.5.2. BECMG. The change group BECMG GGGeGe shall be used to indicate a change to forecast meteorological conditions expected to occur at either a regular or irregular rate at an unspecified time within the period identified in GG to GeGe. The time period described by a BECMG group will usually be 1 hour and never exceeds 2 hours. This change to the predominant conditions shall be followed by a description of all elements for which the change is forecast. The forecast conditions encoded after the BECMG GGGeGe group are those elements expected to prevail from the ending time of this change group(GeGe) to the ending time of the forecast period (G2G2) as indicated by the valid time of the TAF. When using the BECMG group to forecast a change in one or more elements, the entire element(s) must be repeated. For example, if the BECMG group was utilized to forecast a decrease in the ceiling and all other forecast layers were expected to remain the same, the entire cloud code group must be repeated, not just the ceiling layer.

1.7.5.3. TEMPO. The change group TEMPO GGGeGe group shall be used to indicate frequent or infrequent temporary fluctuations to the forecasted meteorological conditions. Conditions described by the TEMPO group will occur for less than 1 hour at a time (1 hour 15 minutes for thunderstorms, the extra 15 minutes providing for the 15-minute period between the time thunder is last heard and the thunderstorm is officially ended) and, in the aggregate, cover less than half of the period indicated by the time GGGeGe

1.7.6. AMD or COR GGgg . Append this group as the last TAF entry to identify an amended TAF, a corrected TAF, or a corrected TAF amendment. The "GGgg" is the time (UTC) the amendment or correction was issued. Issue amendments for the entire remaining period of the TAF. When issuing a correction, repeat the entire text (as corrected) of the original TAF.

1.7.6.1. AMD or COR. These indicators can be used individually or together. For example, the last entry of a 011212Z TAF amended at 011410Z would be "AMD 1410". The last entry of a TAF corrections issued at 011420Z to a TAF amendment issued at 011410Z would be "AMD COR 1420".

1.7.7. Limited Forecast Service Indicators. Limited Duty Stations (LDS) have less than 24-hour-per-day on-site forecast support. These stations will identify, with remarks, when there is limited met watch support or no met watch support.

1.7.7.1. Limited met watch support stations are those stations that have a specified forecast agency that provides some met watch to the station as designated by the MAJCOM. Under limited met watch, the agency providing the support will only amend for warning criteria as coordinated. The LDS will add the remark "LIMITED MET WATCH 0300Z TIL 1000Z" with the times for start and end of limited met watch on the last TAF of the day.

1.7.7.2. Stations that do not have limited met watch will add the remark "LAST NO AMDS AFT YYGG NEXT YYGG" on the last TAF issued each day (where YY is the day of the month (UTC) and GG is the time, to the nearest whole hour (UTC). NOTE: If only one TAF is issued a day, include the remark.

1.7.8. FNXXT/QCYY. Final remark of any remotely issued TAF. This will ensure remotely issued TAFs are not included in the automated TAF verification statistics for each supported location.

Chapter 2

NATIONAL WEATHER SERVICE (NWS) FORECAST CODES

2.1. Source of Codes. The NWS codes were extracted from Federal Aviation Administration Advisory Circular 00-45, Aviation Weather Services, and the NWS Operations Manual.

2.1.1. Valid Period. Scheduled terminal forecasts are valid for 24 hours.

2.2. National Weather Service (NWS) Aerodrome Forecast (TAF) Code. The NWS TAF code is basically the same as WMO FM 51, TAF, and is described fully in the NWS Operations Manual, Chapter D-31. **NOTE:** NWS had not finalized their instructions for the new TAF code in time for this publication. When the final instructions are published changes will be made to this publication.

2.2.1. Terminal Forecast Preparation and Coding . A NWS TAF shall consist of a concise statement of the expected meteorological conditions significant to aviation at an airport during a specified time period. The U.S. definition of an airport is the area within 5 statute miles of the center of an airport's runway complex. Also note, however, the definition and use of the term vicinity (VC) below.

2.2.1.1. An aviation terminal forecast shall include at least information about surface wind, visibility, weather and cloud (or vertical visibility into a surface-based obscuration) and any expected significant change(s) to one or more of these elements during the specified time period, which shall ordinarily be 24 hours. Under some circumstances, however, a terminal forecast may be issued for a shorter period. For example, if essential observational data are not available at the time of scheduled forecast preparation, a forecast issuance may be delayed, resulting in the preparation of a forecast for less than 24 hours.

2.2.1.2. Vicinity (VC). In the interest of aviation safety, it is important to include, in a terminal forecast, a statement related to any of certain meteorological phenomena expected to be in the airport's vicinity (VC) during the period or any part of the period of the forecast. For this purpose, "vicinity" is defined as an area between circles with radii of 5 and 10 statute miles respectively, from the center of the runway complex of an airport.

2.2.1.3. Forecast Terminal, United States (FTUS). This signifies the TAF is a 24-hour TAF issued for an airport in one of the 48 contiguous states. "KMIA" is the ICAO location identifier--note that it begins with a "K"--of the meteorological office in the "lower 48 states" that prepared the TAF. The location identifiers indicating the NWS offices in the North Pacific (that is, Honolulu, Guam, Anchorage, Fairbanks and Juneau) all begin with a "P". Similarly, the location identifier of the NWS office in the Caribbean (San Juan) begins with a "T".

2.2.1.4. Date-Time Group. The group "011600Z" is the date-time group. The first two digits indicate the day of the month that the forecast was prepared. This bulletin was transmitted on the first day of the month. The last four digits indicate the time of the full hour in Universal Coordinated Time (UTC) preceding the transmission time. This bulletin was transmitted after 1600 UTC but before 1700 UTC on the first day of the month.

2.2.1.5. TAF Modifier. "(BBB)" is an indicator group only used in the bulletin heading when a routine TAF bulletin is delayed, corrected, or amended. This group is omitted if not required. The indicators used are:

RTD - delayed routine weather bulletin,

COR - corrected bulletin,

AMD - amended bulletin.

2.2.2. Forecast Text . The forecast text is made up of only the abbreviation "TAF" or "TAF AMD" (i.e., neither "TAF RTD" nor "TAF COR" is to be included in the forecast text) and the individual TAFs are made up of code groups in the following format:

Notes:

1. Parentheses indicate groups which shall not be used in NWS TAFs.
2. See 2.2.8 for an explanation of CAVOK.
3. See 2.2.11 for an explanation of WS (non-convective low-level wind shear).
4. See 2.2.12 for an explanation of optional groups $6I_c$ (icing), 5B (turbulence) and T (temperature).

TAF
CCCC YYGG$_{gg}$Z Y$_1$Y$_1$G$_1$G$_1$G$_2$G$_2$ dddffGf$_m$f$_m$KT
{N$_s$N$_s$N$_s$h$_s$h$_s$h$_s$

{VVVV {w'w' {or
{or {or {Vvh$_s$h$_s$h$_s$
{(CAVOK) {NSW {or
{SKC (or NSC)
WSh$_x$h$_x$h$_x$/dddffKT (6I$_c$h$_i$h$_i$h$_i$t$_L$) (5Bh$_B$h$_B$h$_B$t$_L$) (TT$_F$T$_F$/G$_F$G$_F$Z)
{TTTTT GGG$_e$G$_e$
PROBC$_2$C$_2$ GGG$_e$G$_e$ {or
{TTGGgg

[The non-convective low-level wind shear group (WS) is a national coding practice in the U.S. (see section 10.2.9) to be used on an as-required basis. It is not be considered an optional group in the sense of a group whose use is based on an ICAO Regional Air Navigation agreement.]

2.2.2.1. The abbreviation TAF or TAF AMD is included only once in each product, whether it contains one or more TAFs.

2.2.3. Location Identifier - CCCC. Following the line containing the abbreviation TAF or TAF AMD, each TAF shall begin with its four-letter ICAO location identifier. A complete list of these identifiers is given in ICAO Document 7910, Location Indicators. The order in which location identifiers are placed in a bulletin should be decided upon by the region or NWS office concerned and remain unchanged insofar as possible. Newly added terminals should be placed at the end of the bulletin. Location identifiers remaining after a deletion should occupy the same relative order as before the deletion.

2.2.4. Date-Time Group of Forecast Origin - YYGGggZ . This group follows the aerodrome's location identifier. It states the date and time (UTC) of actual forecast preparation.

Examples:

TAF

KIAD 010450Z

KJFK 092251Z

2.2.5. Valid Periods - $Y_1Y_1G_1G_1G_2G_2$ and Routine Issuance's . The forecast valid period immediately follows the date-time group of forecast origin. The valid period shall be for 24 hours. Routine issuances shall begin at the main synoptic times (00, 06, 12, and 18 UTC). The first two digits (Y_1Y_1) represent the date of the month of the beginning of the valid period. The second two digits (G_1G_1) of the valid period indicate the beginning valid time (two-digit hour) in UTC. The last two digits (G_2G_2) indicate the ending valid time (two-digit hour) in UTC. The time of a forecast period beginning at midnight UTC shall be indicated as 00. The time of a forecast period ending at midnight UTC shall be indicated as 24.

Examples:

TAF

KCHS 020445Z 020606 text TEMPO 1824 (not "TEMPO 1800")

text

KBGR 161654Z 161818 text TEMPO 0006 (not "TEMPO 2406")

text

TJSJ 272249Z 280024 (not "280000" nor "282424") text

2.2.6. Wind Group - dddffGf_mf_mKT . Forecasts of wind should be encoded to express the mean true direction in tens of degrees and the mean speed in knots. Gusts are defined as rapid fluctuations in wind speed with a variation of 10 knots or more between peaks and lulls. Gustiness is indicated immediately after the mean wind speed by the letter "G" followed by the peak gust speed expected. Wind speeds expected to be calm shall be encoded as 00000KT. Variable wind direction shall be encoded as VRBffKT when it is impossible to forecast a mean wind direction, e.g., for very light winds (3 knots or less) or during convective activity. Wind speeds of 100 knots or more shall be expressed as fff (or $f_mf_mf_m$, for gusts), i.e., in three digits.

Examples:

TAF

CCCC 021647Z 021818 29012G24KT

CCCC 041650Z 041818...Text...PROB40 2102 VRB20G45KT 1SM

TSRA OVC012CB

CCCC 171030Z 171212 06090G120KT

CCCC 010425Z 010606 080100G140KT

CCCC 060437Z 060606 12004KT

CCCC 092249Z 100024 27015KT

2.2.6.1. The above example reflects the WMO regulation and ICAO standards and recommended practices as based upon user requirements. Variable wind direction forecasts are of course very appropriate during convective activity and are often the case at low wind speeds. In the case of the latter, forecaster judgment is the final arbiter in determining whether to forecast either a mean or variable wind direction with low wind speeds, keeping in mind that the user needs our best estimate. Also note that there are no amendment criteria for these low wind speed conditions.)

2.2.7. Visibility Group . The visibility group (VVVV) is coded in statute miles (SM) and (for lower visibility's) fractions, leaving a space between them, for example, 1 1/2SM. If the visibility is not expected to be the same in different directions, prevailing visibility shall be used. Visibility reductions caused by volcanic ash, regardless of the degree, shall always be forecast. For example, an expected reduction of visibility by volcanic ash to 10 statute miles should be forecast as P6SM VA.

2.2.8. CAVOK . The WMO Manual on Codes states that the contraction CAVOK (pronounced KAV-OH-KAY) shall be included in place of the visibility, cloud/obscuration and significant weather groups when the following conditions are expected to exist simultaneously. Note: CAVOK shall not be used in TAFs prepared by NWS offices. The information below is provided to assist in the understanding of TAFs prepared by other countries.)

2.2.8.1. Visibility: 10 km or more (meaning more than 6 statute miles);

2.2.8.2. No cloud below 1,500 meters (5,000 feet) or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus. Note: Highest minimum sector altitude is defined by ICAO as the lowest altitude which may be used under emergency conditions which will provide a minimum clearance of 1,000 feet (300 meters) above all objects located in an area contained within a sector of a circle of 25 nautical miles (46 km) radius centered on a radio aid to navigation. In the U.S., minimum sector altitudes have been established for each airport for which instrument approach procedures have been established; the altitudes are shown on instrument approach procedure charts.)

2.2.8.3. No significant weather phenomena (see table 1.2)

2.2.9. Significant Weather Group . The significant weather group (w'w') consists of the appropriate selection of letters (two or more) giving the expected weather phenomenon/phenomena, preceded as necessary by qualifier(s). Note: the weather phenomenon code UP (unknown precipitation) is not used in TAFs. When no significant weather is expected, the group w'w' (including NSW, meaning "no significant weather") shall be omitted. There is one exception to this rule: use NSW when forecast significant weather is expected to end, that is, in a TEMPO or BECMG group. In many cases, only one weather phenomenon should be included in any one TAF time period. This, of course, will not always apply and forecaster judgment as to weather phenomena to be included shall be the rule. When more than one weather phenomenon (except precipitation combinations) are expected to occur during any one TAF time period, the relevant two-letter code for each should be depicted with one space between them. A qualifier(s), if relevant shall precede, without space, the phenomenon to which it applies. Examples: -DZ FG, -RA BR, -RA FG, +SN FG. Note: The "qualifiers" referred to are "minus" (-), meaning "light" and "plus" (+), meaning "heavy". If no qualifier is included, that indicates "moderate" intensity. In the case of precipitation combinations, for example, +TSRAGR, the intensity categories (light, moderate, and heavy) refer to the precipitation -- rain and hail in this case -- and not to the intensity of the thunderstorm, which is a descriptor. The effects, however, can

be applied, namely, thunderstorm(s) with wind gusts of 50 knots or higher and/or hail of 3/4 inch or greater diameter.

Example:

TAF

CCCC 091657Z 091818 VRB30G60KT 1/8SM +TSRAGR

2.2.9.1. A visibility threshold must be met before a forecast for fog can be included in the TAF. When forecasting a fog-restricted visibility that is 5/8SM (1,000 meters) to 6SM (9,000 meters), encode the weather as BR (mist). When forecasting a fog-restricted visibility that is less than 5/8SM (1,000 meters), use code FG (fog). Never encode weather as either fog (FG) or mist (BR) when the forecast visibility is greater than 6SM (9,000 meters), i.e. indicated as P6SM.

2.2.9.2. The significant weather group to be included in a TAF, if any, shall be a coded group. Once a significant weather code group has been used, the entry for the significant weather group in the next change group in the TAF (i.e. BECMG or TEMPO) must be a code group or the abbreviation NSW -- no significant weather -- if conditions are forecast to change. If the significant weather group does not differ in the succeeding change groups (TEMPO and BECMG), no additional significant weather group is necessary and the original group will apply to these subsequent groups. This rule does not apply to FMGGgg groups (i.e., NSW shall never be used in FMGGgg groups). After NSW is used to forecast significant weather, any subsequent significant weather groups shall be omitted or selected from the phenomena list. No two consecutive change groups (TEMPO or BECMG) shall contain NSW as the significant weather group.

Examples:

TAF

CCCC 020447Z 020606 27010KT 1/2SM FG VV010

CCCC 041041Z 041212 27006KT 1/2SM FG VV008

FM1300 P6SM SCT035

CCCC 051048Z 051212 27006KT 1/2SM FG VV010 BECMG 1415

27010KT P6SM NSW FEW040

CCCC 031046Z 031212 04005KT 1SM BR SCT100

CCCC 021041Z 021212 04006KT 3SM DZ OVC008 BECMG 1719

36010KT P6SM NSW FEW025

2.2.9.3. When certain meteorological phenomena are expected to occur in the airport's vicinity (VC), they shall be included in the TAF. Such phenomena, by definition, are limited to duststorm, sandstorm, dense fog (visibility less than 3 statute miles), shower (without qualification as to intensity or whether frozen or liquid), thunderstorm, funnel cloud, dust devils, blowing dust, blowing sand and blowing snow. The expected existence of any such phenomena in an airport's vicinity shall be stated as in combination with the proximity qualifier VC, that is, as VCDS, VCSS, VCFG, VCSH, VCTS, VCFC, VCPO, VCBLDU, VCBLSA and VCBLSN. The entry of a forecast of such phenomena should follow the weather (w'w' or NSW) group.

Examples:

TAF

CCCC 050449Z 050606 VRB03KT 2 1/2SM -DZ VCFG BKN025 etc.=

TAF

CCCC 101051Z 101212 30015G25KT P6SM VCTS OVC015 etc.=

TAF

CCCC 121648Z 121818 30012KT P6SM VCSH OVC018 etc.=

2.2.10. Cloud and Obscuration Group . The cloud or obscuration group ($N_sN_sN_sh_sh_sh_s$ or VVh_s-h_sh_s or SKC or NSC) shall be used as appropriate to indicate the cumulative amount of all cloud layers in ascending order ($N_sN_sN_s$) and height ($h_sh_sh_s$); to indicate vertical visibility (hshshs) (identified by the indicator VV) into a surface-based obscuring medium, or to indicate a clear sky (SKC). (The use of NSC -- no significant cloud -- to indicate sky condition without cloud of operational significance is a procedure requiring a regional air navigation (RAN) agreement under the auspices of ICAO. Such RAN agreement is not in effect for the United States or any of its territories or possessions and is therefore not to be used by NWS offices. Its meaning, however, for decode purposes, is elaborated upon later in this section.)

2.2.10.1. $_sN_sN_sh_sh_sh_s$. This group is used to forecast cloud amount ($N_sN_sN_s$) as clear (SKC - 0 oktas), few (FEW - less than 1 okta to 2 oktas), scattered (SCT - 3 or 4 oktas), broken (BKN - 5 to 7 oktas) or overcast (OVC - 8 oktas). Height of cloud ($h_sh_sh_s$) is expressed in hundreds of feet above ground level (AGL) (units of 3<><><><>0 meters in metric). Cloud type is given only for cumulonimbus (CB) cloud, in which case the abbreviation CB follows cloud height without a space.

Examples:

FEW030 - few clouds (less than 1 okta to 2 oktas), no CB, bases 3,000 feet (900 meters) above ground level (AGL)

SCT025 - scattered clouds (3 or 4 oktas), no CB, bases 2,500 feet (750 meters) AGL

BKN015CB- broken cloud layer (5 to 7 oktas), including CB, bases 1,500 feet (450 meters) AGL

OVC150 - overcast cloud layer (8 oktas), no CB, bases 15,000 feet (4500 meters) AGL

2.2.10.2. $VVh_sh_sh_s$. This group is used to forecast vertical visibility, VV, in hundreds of feet (units of 30 meters in metric). VV, an indicator, is always to be used as such, i.e. as VV, when calling for vertical visibility. There is no provision in the TAF code for specifically forecasting a partial obscuration. The lowest level at which the cumulative cloud cover equals 5/8 or more shall be considered to be the forecast ceiling. This layer should be indicated, for example, as VV020, as BKN020 or as OVC020, indicating a 2,000-foot ceiling in each example.

Examples:

VV015 - Surface-based obscuration, vertical visibility 1,500 feet. For user purposes, and in the interest of flight safety, it should be understood that the forecast that has been issued is for a complete obscuration of the sky, that is, for a ceiling of 1,500 feet.

FEW025 - Sky cover of less than 1/8 to 2/8, base of clouds 2,500 feet AGL. This should be an alternative to calling for a surface-based obscuration with a vertical visibility of 2,500 feet.

SCT015 - Sky cover of 3/8 or 4/8, base of clouds 1,500 feet AGL. This also could be an alternative to calling for a surface-based obscuration with a vertical visibility of 1,500 feet.

BKN015 - Sky cover of 5/8 to 7/8, base of clouds 1,500 feet. This is an acceptable alternative to indicating an obscuration, as in the preceding example.

2.2.10.2.1. The WMO world-wide procedure allows for the height of cloud or vertical visibility to be expressed in hundreds of feet (units of 30 meters) above ground level. This applies for all levels, regardless of height. In the NWS, this procedure should be followed only up to 3,000 feet, with 500 foot intervals to be used from 3,000 feet to 5,000 feet, and 1,000 foot intervals above 5,000 feet.

2.2.10.2.2. SKC. When a clear sky (meaning cloud amount, if any, of 0/8) is forecast, the cloud group shall be replaced by the abbreviation SKC. The abbreviation CLR shall not be used in the TAF.

Examples:

TAF

CCCC 110437Z 110606 24015KT P6SM SKC BECMG 0809 1SM BR VV008

CCCC 110437Z 110606 06008KT P6SM SKC BECMG 1112 2SM -RA OVC012

CCCC 221650Z 221818 19010G25KT P6SM BKN040

FM2200 26025G45KT 1SM SHSN OVC010

2.2.10.2.3. NSC. The use of this abbreviation, as stated before, would be appropriate only if called for by an ICAO RAN agreement. This would be an agreement, based on operational requirements, resulting in a decision to limit cloud information in TAFs to clouds of operational significance. Such clouds would be below 5,000 feet (1,500 meters) or below the highest minimum sector altitude, whichever is greater, and CB (any height) whenever forecast. In applying this limitation, and when the use of neither CAVOK (see 10.2.6) nor SKC would be appropriate, the term NSC could be used. As stated before, no such RAN agreement is in effect for the United States or any of its territories or possessions. Thus, "NSC" is not to be used in NWS TAFs.

2.2.11. Non-Convective Low-Level Wind Shear . Low-level (up to about 2,000 feet AGL) wind shear (LLWS) is a potentially hazardous problem for aircraft preparing for approach to or take-off from airports. LLWS is of particular concern in North America. There is no provision for forecasting wind shear in the international TAF code. However, NWS offices shall include a forecast of LLWS, when applicable, in the TAF based, on a national coding practice. A study giving guidance in procedures that may be followed in alleviating or countering this hazard has been published (see NOAA Technical Memorandum NWS FCST-23, "Low-Level Wind Shear: A Critical Review", by Julius Badner, NWS Meteorological Services Division, April 1979, reprinted February 1989). The application of the guidance is given below. Forecasts of non-convective LLWS should be included in NWS terminal forecasts, on an as needed basis, to focus the attention of the pilot on LLWS problems, existing or expected. LLWS should be included, as indicated below, whenever:

2.2.11.1. PIREPs, of shear within 2,000 feet of the surface, at or in the vicinity of the TAF airport, causing an indicated air speed loss or gain of 20 knots or more are received, AND the forecaster determines that the reports reflect a valid LLWS event rather than mechanical turbulence due to strong surface winds; or

2.2.11.2. When vertical shear of 10 knots or more per 100 feet in a layer more than 200 feet thick are expected or reliably reported within 2,000 feet of the surface at or in the vicinity of the airport (see referenced Technical Memorandum, page 21, Table 3 -- Wind Shear Computation Table).

2.2.11.3. The first, and perhaps best, tool for detecting or observing LLWS are the Velocity Azimuth Display (VAD) wind profiles from the WSR-88D. The VAD wind profiles should be helpful in forecasting LLWS in the short term. Low-level wind shear forecasts should be issued in the following format:

$WSh_xh_xh_x$/dddffKT, where:

WS = an indicator meaning wind shear;

$h_xh_xh_x$ = height at which the wind shear threshold is reached;

ddd = direction, degrees true, of the forecast wind above the indicated height;

ff = speed, in knots, of the forecast wind above the indicated height; and

KT = a units indicator, meaning knots

Example:

CCCC 192251Z 200024 21006KT ... P6SM WS015/30035KT

2.2.12. Optional Groups . The optional groups (enclosed in parentheses; see the code form in section 10.2) are to be used as called for by ICAO RAN agreement(s). Such RAN agreement is in effect, with respect to U.S. aerodromes in the Pacific, for aerodromes as agreed between the U.S. and the operators concerned, for temperatures only, and, similarly, with regard to icing, turbulence, and temperature for U.S. aerodromes in the Caribbean only. (Such agreements, in respect of both the Pacific and the Caribbean between the U.S. and any operator(s) concerned, have never been consummated. Thus at present, there is no requirement for the issuance of optional group(s) in NWS TAFs.) Arrangements for the issuance of optional group data as, and when, required will be made by NWS headquarters. Explanations concerning their use follow.

2.2.12.1. The Icing Group ($6I_ch_ih_ih_it_L$) provides the means to include, in the TAF, forecasts of layers and types of icing at or in the vicinity of an aerodrome. The group may be repeated as often as necessary to indicate more than one layer or type of icing. If the forecast thickness of the layer for any one type of forecast icing is greater than 9,000 feet (2,700 meters), the group should be repeated, and the base indicated in the second group is to coincide with the height of the top of the layer as given in the preceding group. To explain the code: 6 is an indicator identifying the icing group; I_c is the type of forecast ice accretion on the external parts of aircraft) $h_ih_ih_i$ is the height of the lowest level of icing, expressed in hundreds of feet/units of 30 meters above the aerodrome elevation (001 = 100 feet/30 meters); and tL is the thickness of the layer of icing expressed in thousands of feet/units of 300 meters. Examples:

630005	Forecast light icing in precipitation from a height at or near aerodrome elevation up to 5,000 feet/1,500 meters above aerodrome elevation.
690057	Forecast severe icing in precipitation from a height of 500 feet/150 meters above aerodrome up to 7,500 feet/2,250 meters above aerodrome elevation.
650509 651402	Forecast moderate icing in cloud from 5,000 feet/1,500 meters above aerodrome elevation up to 16,000 feet/3,300 meters above aerodrome elevation. Note that the base indicated in the second group (14,000 feet) coincides with the top of the layer as given in the first group (5,000 feet + 9,000 feet = 14,000 feet).

2.2.12.2. The Turbulence Group ($5_B h_B h_B h_B t_L$) provides the means to include, in the TAF, forecasts of layers and severity/ frequency of turbulence at or in the vicinity of an aerodrome. The group may be repeated as often as necessary to indicate more than one layer and/or severity/frequency of turbulence. If the thickness of the layer for any one frequency or severity of turbulence is greater than 9,000 feet (2,700 meters), the group should be repeated and the base indicated in the second group should coincide with the top of the layer as given in the preceding group. To explain the code: 5 is an indicator identifying the turbulence group; B indicates the severity and frequency of the forecast turbulence, h $h_B h_B$, is the height of the lowest level of turbulence, expressed in hundreds of feet/units of 30 meters above aerodrome elevation; and t_L is the thickness of the layer of turbulence.

Examples:

530907 - Forecast moderate turbulence in clear air, frequent, from a height of 9,000 feet/2,700 meters above aerodrome elevation up to 16,000 feet/4,800 meters above aerodrome elevation.

563004 - Forecast severe turbulence in clear air, occasional, from a height of 30,000 feet/9,000 meters above aerodrome elevation up to 34,000 feet/10,200 meters above aerodrome elevation.

2.2.12.3. The Surface Temperature Group ($TT_F T_F / G_F G_F Z$) provides the mechanism for including forecast temperature ($T_F T_F$, whole degrees Celsius) in the TAF code for specific times. One or more such groups may be used to give, for example, forecast temperatures at certain times or to indicate expected maximum temperatures and the forecast time of occurrence. To explain the code: T is an indicator, meaning "temperature"; $T_F T_F$ is symbolic for the forecast temperature in whole degrees Celsius (C); $G_F G_F$ is symbolic for the valid time to the nearest whole hour UTC of the temperature forecast; and Z is an abbreviated symbol meaning Universal Coordinated Time (UTC). Temperatures between +9°C and -9°C are to be preceded by 0; temperatures below 0°C are to be preceded by the letter M (for minus).

Examples:

T17/20Z - forecast temperature of 17°C at 2000Z

T08/21Z - forecast temperature of 8°C at 2100Z

T00/18Z - forecast temperature of 0°C at 1800Z

TM10/07Z - forecast temperature of minus 10°C at 0700Z

2.2.13. Forecast Change Indicators . The following groups shall be used when a change in some or all of the elements forecast is expected to occur at or near some time GGgg or during the period GG to GeGe. To keep the forecast intent clear and unambiguous, the use of change indicators should be done with care and kept to a minimum. Overlapping of forecast periods should be avoided. Only one possible variation to the prevailing forecast conditions should normally be called for during any specific period of time. The subdivision of the forecast period by FMGGgg may be used -- in fact, is encouraged -- to avoid the necessity of describing overly complex forecasts in cases where many significant changes to weather conditions are expected to occur throughout the forecast period.

2.2.13.1. FMGGgg. The time-divider group TTGGgg in the form FMGGgg (from GGgg) should be used where one set of prevailing weather conditions is expected to change significantly and more or less completely, to a different set of conditions. In such instances, the forecast shall be sub-divided into time periods using the abbreviation "FM", followed, in all instances, by four digits (in hours and minutes UTC) indicating the time the change is expected to occur. Note that this is a four-digit beginning time, coded in hours and minutes. While the use of whole hours (e.g. 2300 UTC) remains acceptable, if a forecaster can predict changes and/or events with higher resolution, minutes (e.g. 2315 UTC) should be used. All forecast groups following FMGGgg shall be understood to relate to the period of time from GGgg (in the FMGGgg group) to the end of the 24-hour forecast period or to the next FMGGgg if the forecast period is divided into more than two self-contained periods. The subdivided time period should be a complete description of the weather (i.e., self-contained) and all forecast conditions given before the FM group are superseded by those following the group. There may be one, or more than one, such group, depending on the number of distinguishable sets of prevailing weather conditions expected. In the interest of clarity, each FM group should start on a new line of forecast text, indented five spaces.

Example:

TAF

CCCC 022251Z 030024 20015KT P6SM -SHRA BKN015

FM0230 29020G35KT 1SM +SHRA OVC005

FM0320 31010G20KT P6SM SCT025 TEMPO 0507 1/4SM +SHSN

CCCC 221647Z 221818 13008KT P6SM SCT030

FM0300 30015G30KT 3SM -SHSN BKN015

FM0500 31010KT 1/4SM +SHSN VV007

2.2.13.2. The change-indicator groups are expressed in two forms: BECMG GGG_eG_e and TEMPO GGG_eG_e.

2.2.13.2.1. BECMG. The change indicator group TTTTT GGG_eG_e in the form BECMG GGGeGe shall be used to indicate a change to forecast meteorological conditions expected to occur at either a regular or irregular rate at an unspecified time within the period GG to G_eG_e. Note this is a period of time defined between a two-digit beginning time, in hours, and a two-digit ending time, also in hours.

Example:

TAF

KDFW 220447Z 220606 21010KT P6SM SCT030 BECMG 1012 1SM TSRA OVC010CB

In the example shown above, the BECMG group applies to the window of time between 1000 and 1200 UTC. The duration of the time period covered by BECMG should normally not exceed 2 hours and in any case shall never exceed 4 hours. The change group shall be followed by a description of all the elements for which a change is forecast. An element for which no change is forecast during the period GG to GeGe shall be understood to remain as called for in the portion of the TAF preceding GG.

2.2.13.2.2. TEMPO. The change indicator group TTTTT GGG_eG_e in the form TEMPO GGG_eG_e should be used to indicate frequent or infrequent temporary fluctuations to forecast meteorological conditions which are expected to last less than 1 hour in each instance and, in the aggregate, to cover less than half of the period GG to G_eG_e. Note that this is a period of time between a two-digit beginning time, in hours, and a two-digit ending time, also in hours. If the temporary condition is expected to last 1 hour or more, the change group BECMG GGG_eG_e or FMGGgg should be used to call for conditions different from those forecast prior to GG. If the temporary forecast condition is expected to cover, in the aggregate, more than half of the period GG to G_eG_e, then the temporary condition should be expressed as the predominant feature and consequential changes made as necessary. In general, the period of time covered by a TEMPO group should not exceed four hours.

Example:

TAF

KORD 221045Z 221212 29010G25KT P6SM SCT025 TEMPO 1820 1 1/2SM SHRA BKN010

In the example shown above, temporary changes are forecast between 1800 and 2000 UTC.

2.2.14. Probability Forecasts . The probability group ($PROBC_2C_2$ GGG_eG_e) shall be used by NWS offices only to forecast the probability of occurrence of a thunderstorm (and associated precipitation) or precipitation event, along with associated weather elements (wind, visibility and/or sky condition) whose occurrences are directly related to, and contemporaneous with, the thunderstorm or precipitation event. The PROB group states the forecaster's assessment of the probability of occurrence of the weather event that follows it. PROB shall be followed by two digits (*either 30 or 40* in NWS-prepared TAFs), giving probability in percent, and by a space and four digits (GGG_eG_e) giving the beginning and ending hours of the time period during which the forecast condition is expected. The PROB group shall not be used in the first six hours of the valid period of each TAF. The decision to use PROB in a TAF should be based on the fact that it is limited to a 5 statute mile radius around the airport terminal. This is usually a significantly smaller area than the zone covered by the corresponding public forecast. The 6- or 12-hour area precipitation probability (PoP) guidance and a forecaster's hourly expectations of actual occurrence at an airport can vary over relatively short periods of time but should be synoptically consistent and represent a refinement of the larger area's PoP. The PROB group shall be used by NWS offices only to express the probability of occurrence of thunderstorms or precipitation events and associated conditions expected to cover the range of roughly 30 percent to 45 percent, but not including 50 percent. If the probability of the thunderstorm or precipitation event is expected to equal or exceed 50 percent, then that occurrence of the event should be considered to be a predominant feature of the forecast and entered in the main body of the TAF, in a BECMG or TEMPO group, or following a time indicator (FMGGgg) group. The PROB group shall not be used by NWS

offices as a direct modifier of the change group BECMG or TEMPO or with the time indicator group FMGGgg as defined below. Similarly, none of these groups may be used by NWS offices as a direct modifier of the PROB group. The reason for these prohibitions is to avoid confusion as to the intent of the forecaster. WMO TAF regulations allow the use of PROB30 or PROB40 in combination with the TEMPO group. The WMO regulations state that, when used, the PROB group is to be placed immediately before the change group TEMPO and that the group GGG_eG_e is to be placed after TEMPO, for example, PROB30 TEMPO 1214 or PROB40 TEMPO 1214. *This procedure shall not be employed by NWS offices* and is described here only to assist in decoding TAFs that may be received in the U.S., its territories or possessions from other meteorological services.

2.2.15. Unscheduled Forecasts . Unscheduled forecasts are issued on an as-needed basis as amended (AMD), corrected (COR) or delayed (RTD) messages. They contain the same elements and use the same format as scheduled issuances except for different beginning valid periods (for RTD and AMD) and date and time of forecast origin. The six-digit issuance time followed by "Z" shall be included in all unscheduled TAFs. With an issuance time of H+00 to H+29, use the current hour to denote the beginning valid time. For H+30 to H+59, use the next t hour. In either case the TAF shall be valid from the time of forecast origin (YYGGgg) to the valid period ending time. See paragraph 2.2.18 for guidance on the beginning valid period time and time of forecast origin to be included in corrected forecasts.

2.2.16. Amended Forecasts . NWS offices that prepare TAFs shall keep the forecasts under continuous review so as to ensure necessary amendments are issued promptly. An amended TAF shall be identified by the prefix TAF AMD in place of TAF on the first line of the forecast text. The indicator AMD shall also follow the date-time group in the bulletin heading. The amended TAF shall cover all of the remaining valid period of the original TAF. In the forecast valid period group ($Y_1Y_1G_1G_1G_2G_2$), the first four digits ($Y_1Y_1G_1G_1$) shall reflect the UTC date and time of the beginning of the period of validity of the amended TAF. Note, however, that the group giving the date and time of the forecast origin (YYGGggZ) shall reflect the time the amended TAF was issued. TAF amendments shall be issued in accordance with the following criteria. Note that vicinity (VC) events, by definition, are not at the airport and therefore do not require an amendment.

2.2.16.1. Ceiling Amendment Criteria.

-in the forecaster's judgment the forecast is nonrepresentative, or the ceiling falls to 3000 feet or below

-increases to greater than 3000 feet, or falls below 2000 feet

-increases to equal or exceed 2000 feet, or falls below 1000 feet

-increases to equal or exceed 1000 feet, or falls below 600 feet

-increases to equal or exceed 600 feet, or falls below 200 feet

-increases to 200 feet or more

2.2.16.2. Visibility Amendment Criteria.

-decreases to 5 statute miles or less

-increases to 7 statute miles or more, or falls below 3 statute miles

-increases to 3 statute miles or more, or falls below 2 statute miles

-increases to 2 statute miles or more, or falls below 1 statute mile

-increases to 1 statute mile or more, or falls below 1/2 statute mile

-increases to 1/2 statute mile or more

2.2.16.3. Thunderstorm, Freezing precipitation, or Ice Pellets.

-phenomenon is no longer expected at the airport

-occurs or is expected at the airport

2.2.16.4. Mean Wind Direction, Speed, and Gusts.

-wind direction: Amend if the mean wind direction for the remainder of the forecast period is expected to differ by 30 degrees or more, with an accompanying mean wind speed of 12 knots or more.

-mean wind speed: Amend if the actual mean wind speed will differ from forecast group mean speed by 10 knots or more, and the original mean wind speed was 12 knots or more, or the newly expected mean wind speed is 12 knots or more.

-peak gust (or forecast of no gust) of 10 knots or more above forecast gust (or above the forecast mean wind speed if no gusts are forecast) occur or are expected, and mean speeds of 12 knots or more are expected.

2.2.16.5. Non Convective Low Level Wind Shear (WS).

-no WS expected and WS in the TAF

- WS expected and no WS in the TAF

Examples:

Original	Amended
PDXTAFPDX	PDXTAFPDX
TTAA00 KPDX 292200	TTAA00 KPDX 292200
TAF	TAF AMD
KPDX 292251Z 290024	KPDX 292251Z 290024

2.2.17. Delayed Forecasts . Delayed forecasts are identified by the contraction RTD and shall be issued as soon as possible after correction of the problem (electrical, mechanical or other) that caused the delay. The forecast is valid from the UTC date and time of actual forecast origin (YYGGggZ) until the end of the previously scheduled TAF valid period. The date and time of actual forecast origin (YYGGggZ) should be determined by the UTC date and time of the issuance of the delayed forecast.

Examples:

Original	Delayed
SEATAFSEA	SEATAFSEA
TTAA00 KSEA 170400	TTAA00 KSEA 170400 RTD
TAF	TAF
KSEA 170451Z 170606	KSEA 170641Z 170706

2.2.18. Corrected Forecasts . Corrected TAFs are identified by the contraction COR and shall be issued as soon as possible after discovery of an error (typographical or other mistake). The forecast valid period ($Y_1Y_1G_1G_1G_2G_2$) should be the same as that of the scheduled TAF issuance unless the valid period contained the error. The date-time group of actual forecast origin (YYGGggZ) shall reflect the time the corrected TAF was issued.

Examples:

Original	Corrected
SEATAFSEA	SEATAFSEA
TTAA00 KSEA 170400	TTAA00 KSEA 170400 COR
TAF	TAF
KSEA 170451Z 170606	KSEA 170629Z 170606

2.2.19. Severe Weather Watch (WW). A severe thunderstorm is defined as a thunderstorm accompanied by wind gusts of 50 knots or more and/or hail (surface or aloft) 3/4 inch or more in diameter. The Storm Prediction Center (SPC) issues WWs for tornadoes and severe thunderstorms for the conterminous United States. SPC also issues the Severe Weather Outlook (AC). Both of these products should receive strong consideration in preparing or amending TAFs. However, the forecaster should apply them in the same fashion as any other guidance information. Forecasting the occurrence of any phenomenon for a specific terminal requires the analysis of information from all available sources. This means that TAFs may vary from WWs and ACs to the extent that the forecaster expects conditions at an airport to differ from those over a more generalized area. This approach allows forecasters to avoid forecasting thunderstorms at a single site (point) for long time periods. Issuance of a WW or an AC does not, in itself, require an amendment for the affected airport. Generally, tornadoes should not be mentioned in TAFs because the probability of occurrence at a specific site is very small.

2.2.20. TAF Filing Times . A scheduled TAF is always issued prior to the beginning of the valid period (the valid time) of the TAF. Routine terminal forecast issuances should be filed for transmission 20 to 30 minutes before the beginning of the forecast valid period, e.g. no later than 0540 UTC for TAF valid from the 0600 to 0600 UTC.

2.3. Area Forecast (FA). The FA is a two-section plain language forecast consisting of a hazards or flight section, and synopsis and VFR clouds or weather section. Each section will always have an entry even if it is negative. FAs are prepared three times a day. Hazards are valid for a 12-hour period and Synopsis and VFR Clouds or Weather contain 18-hour synopsis and 18-hour forecast (30 hours in Alaska). The forecast is broken into a 12-hour specific forecast, followed by a 6-hour (18-hour in Alaska) categorical outlook. Only contractions authorized by the FAAH 7340.1, Contractions, are used. All times are universal time coordinated, distances are in nautical miles, and speeds are in knots. Visibility's are given in statute miles. All heights are with reference to mean sea level unless otherwise specified. Alaskan and Hawaiian FAs are similar to those for the continuous 48 states.

Example Area Forecast

FAUS1 KSFO 201045

SFOH FA 201045

HAZARDS VALID UNTIL 202300

WA OR CA AND CSTL WTRS

FLT PRCTNS...MTN OBSCN...WA OR CA

TSTMS IMPLY PSBL SEV OR GTR TURBC SEV ICG LLWS AND IFR CONDS.

NON MSL HGTS ARE DENOTED BY AGL OR CIG.

FAUS2 KSFO 201045

SFOC FA 201045

SYNOPSIS AND VFR CLDS/WX

CLDS/WX VALID UNTIL 202300...OTLK VALID 202300-210500

SYNOPSIS...WEAK CDFNT ALG CSTL SXNS MOVG TO CASCDS AND BCMG STNRY. WK HI

PRES BLDG INTO CSTL SXNS BY 02Z. ALF...MOIST WLY FLOW WL CONT OVR WA OR AND GENLY WK SWLY FLOW OVR CA.

WA OR CASCDS WWD

SEE AIRMET SIERRA FOR MTN OBSCN.

WA NRN OR...15-25 SCT-BKN 35-45 BKN-OVC 100-120. WDLY SCT RW-. 17Z-20Z

BCMG 20 SCT-BKN 50 BKN 80-100. WDLY SCT RW-. TOPS 180. OTLK...VFR.

SRN OR...CLR. OTLK...VFR.

WA OR E OF CASCDS

WA...50-70 SCT 120 SCT. WRN SXNS WDLY SCT RW-. TOPS 180. OTLK...VFR.

OR...CLR. OTLK...VFR.

CA

SEE AIRMET SIERRA FOR MTN OBSCN.

CSTL SXNS OF NRN CA...10-15 BKN 25. AFT 21Z...CLR. OTLK...VFR.

LAX BASIN...15 BKN 25. VSBYS 3-5FH. AFT 16Z...CLR. VSBYS LAX BASIN

3-5FH. OTLK...MVFR CIG F.

RMNDR AREA...CLR. OTLK...VFR.

WA OR CA CSTL WTRS

ALG CST 10-25 SCT-BKN 30 OTHERWISE CLR. OTLK...MVFR CIG F.

Chapter 3

US NAVY AND MARINE CORPS TAF CODE

3.1. Source of Codes. The Navy and Marine Corps codes were extracted from NAVMETOCCOMINST Instruction 3143.1F.

3.2. Navy and Marine Corps TAF Code. The Navy and Marine Corps TAF code is basically the same as WMO FM 51, TAF, and is described fully in NAVMETOCCOMINST Instruction 3143.1F. **NOTE:** The Navy and Marine Corps have not finalized their instructions for the new TAF code in time for this publication.

3.2.1. Purpose. To promulgate the instructions for using the Aerodrome Forecast (TAF) Code.

3.2.2. Background. To standardize the aerodrome forecast with the World Meteorological Organization (WMO), the Naval Meteorology and Oceanography Command and the U.S. Marine Corps are adopting the TAF Code (FM51-IX) as contained in reference (a), with some exceptions.

3.2.3. Discussion. The TAF code was designed to accommodate requirements in direct support of aviation and for use by the forecaster. It provides information about the expected (projected) weather conditions that will occur at the airfield or station control zone as described in the base operation manual or the local forecaster's handbook.

3.2.3.1. Dissemination. The TAF is disseminated locally and longline. Many users rely on this information for making significant judgments and decisions in support of aviation and base operations. It is essential that the information in the TAF is accurate, complete, and derived in all cases, through a thorough consideration of the variables that contribute to the forecast. Moreover, it is essential that the weather conditions are continuously monitored and amendments to the TAF issued when necessary.

3.2.3.1.1. Action. The Naval Meteorology and Oceanography Command and Marine Corps activities shall adopt the TAF Code. This code has significant modifications in comparison to previous formats.

3.2.3.1.2. All TAF's filed at six-hour intervals at 0300, 0900, 1500, and 2100 UTC shall have a valid period of 24 hours. File time of all standard time TAF's will be on the hour of valid time. Amendments are the exception to this rule. The requirements for local dissemination of the TAF will be established locally.

3.3. Coding Instructions and TAF Format.

CCCC TAF (AMD/COR/RTD) Y1Y1G1G1G2G2 ddffGfmfmKT VVVV w'w' NsNsNshshshs or VVhshshs or SKC (WShwshwshws/ddffKT or WSCONDS) (6IchihihitL) (5BhbhbhbtL) QNHPIPIPIPIINS (Remarks) TTTTT GGGeGe/TTGGGG (TTFTF/GFGFZ) (AMD or COR GGGG)

3.3.1. General.

3.3.1.1. Forecast Area. The forecast elements in the main body of the forecast text (winds, visibility, present weather, sky cover layers, etc.) apply to the airfield control zone as delineated in the base operations manual or local forecaster's handbook.

3.3.1.2. TAF Formulation. When formulating a forecast, every effort shall be made to properly present a representative outlook of the forecast elements for the valid period. Whenever possible, avoid redundancy and ambiguity. When conditions warrant, the TAF will reflect the forecast conditions of nationally issued and locally prepared weather warnings and advisories.

3.3.1.3. Specification of symbolic letters.

3.3.1.3.1. Message Heading. The message header shall begin with the four letter ICAO location identifier (CCCC), followed by "TAF"; the (AMD/COR/RTD) indicator, as applicable; and the valid forecast period, day and time, (Y1Y1G1G1G2G2). Amendments to the forecast will be issued for criteria outlined herein. The ending time will be the standard time of the forecast period designated by "G2G2"; e.g., if the 041515 TAF were amended at 041700, the Y1Y1G1G1G2G2 for the amendment would be encoded as 041715. The abbreviation "AMD" represents amended TAF, "RTD" for routine delay, and "COR" for a correction.

3.3.1.3.2. dddffGfmfm. Surface wind direction and speed including gusts, when applicable.

3.3.1.3.2.1. ddd. Forecast the prevailing true wind direction (from which the wind is blowing) to the nearest 10 degrees. When the wind direction is expected to vary by 60 degrees or more, enter the prevailing wind direction as "ddd" and encode the limits of the variability in remarks (e.g., WND 270V350). The contraction "VRB" may be utilized only when the wind speed is 6 knots or less or, in the rare occasions, when it is impossible to forecast a single wind direction at wind speeds exceeding 6 knots; e.g., airmass thunderstorms where the exact location of formation and movement cannot be forecast.

3.3.1.3.2.2. ff. Forecast the mean wind speed in whole knots. When the speed is forecast to be 100 knots or more, use three digits.

3.3.1.3.2.3. Calm Wind. Encode calm wind for dddff as "00000KT".

3.3.1.3.2.4. Gfmfm. Forecast the maximum wind gusts in whole knots. A gust will be forecast when the peak wind is expected to exceed the wind lull by 10 knots or more. When the wind gust is forecast to be 100 knots or more, use three digits.

3.3.1.3.2.5. KT. Units of measure indicated in knots.

3.3.1.3.3. VVVV. Forecast the prevailing visibility in meters, rounded down to the nearest reportable value. Use table 1.1. for reportable values. Include weather and/or obstructions to vision (w'w') whenever the prevailing visibility is forecast to be 9000 meters or less.

3.3.1.3.4. w'w'. Forecast weather and obstructions to vision using table 1.2. Utilizing the standard abbreviations, choose the best combination to describe the forecast condition. The order of precedence for entry is tornadic activity (FC/+FC); thunderstorms (TS); precipitation type(s) with predominant first (intensity applies only to first, most predominant type of precipitation); and obstructions to vision. Shallow ground fog, MIFG, shall be encoded when the fog depth is less than 6 feet and not expected to obscure any part of the sky. A new descriptor, PR, can now be used in METAR and the TAF to describe fog "covering part of the aerodrome", PRFG. When fog is forecast, use BR (mist) when the prevailing visibility is expected to be 5/8's of a mile or more and FG (fog) when the prevailing visibility is expected to be less than 5/8's of a mile. Volcanic Ash. Volcanic ash, VA, shall always be forecasted regardless of restrictions to visibility.

3.3.1.3.5. NsNsNshshshs. Sky Cover group. This group will be reported as often as necessary to indicate all forecast sky cover layers to the first overcast 8/8 layer. Arrange the sky cover layers in ascending order of cloud bases (i.e., lowest layer first). Encode SKC to forecast a clear sky. All clouds and layers are considered to be opaque.

3.3.1.3.5.1. NsNsNs. The sky cover amount NsNsNs shall be given as sky clear, SKC, (no clouds); few, FEW, (1 to 2 oktas); scattered, SCT, (3 to 4 oktas); broken, BKN, (5 to 7 oktas); or overcast, OVC, (8 oktas) respectively, followed without a space by hshshs. The summation principle applies. The summation principle shall be used when forecasting sky cover layers up to and including the first overcast layer.

3.3.1.3.5.2. hshshs. Encode the height of the base of each sky cover layer in hundreds of feet AGL. Express the height to the nearest 100 feet from the surface to 5,000 feet, to the nearest 500 feet from 5,000 feet to 10,000 feet; and to the nearest 1,000 feet above 10,000 feet. Sky cover from the surface to 50 feet are considered to be surface based and encoded as 000.

3.3.1.3.5.3. Cloud Reporting. Types of clouds, other than cumulonimbus, shall not be encoded. Cumulonimbus clouds, when expected, shall always be indicated as a separate layer, forecasted for independently if above the OVC layer, and designated by appending the letter abbreviation CB to the cloud group without a space (i.e., SCT005CB).

3.3.1.3.5.4. Obscurations.

3.3.1.3.5.4.1. Partial. Partial obscuration are no longer considered distinct meteorological phenomenon, but will be considered as the first layer in the sky cover group.

3.3.1.3.5.4.2. Total. VVhshshs. When the sky is expected to be totally obscured, the group VVhshshs shall be encoded in lieu of NsNsNshshshs. The indicator "VV" shall be entered followed by the vertical visibility in hundreds of feet AGL.

3.3.1.3.5.5. If two or more significant sky conditions will alternate frequently from one to the other, describe the conditions in a TEMPO group; do not use variable sky condition remarks.

3.3.1.3.6. WShwshwshws/dddffKT. Non-convective Low Level Wind Shear group. This group is used only to forecast wind shear not associated with convective activity, surface to 2000ft AGL. Complete wind shear information should be included for near term forecasts (usually within six hours) whenever a vector sum difference from the surface to the wind shear height of greater than 20 knots is forecast (i.e., 12 knots from 270 at the surface and 15 knots from 090 at 1600 feet would be forecast as WS016/09015.). To indicate wind shear when complete information can not be reliably forecast with high confidence (usually beyond six hours), use WSCONDS. Omit this group when no low level wind shear is forecast.

3.3.1.3.6.1. WS. Low Level Wind Shear indicator.

3.3.1.3.6.2. hwshwshws. Forecast height of the base of the wind shear zone in hundreds of feet AGL.

3.3.1.3.6.3. ddd. Forecast wind direction, tens of degrees true, in the shear zone.

3.3.1.3.6.4. ff. Forecast wind speed in the shear zone.

3.3.1.3.6.5. KT. Units indicator, knots.

3.3.1.3.6.6. WSCONDS. Optional, less specific, wind shear indicator group.

3.3.1.3.7. 5BhbhbhbtL. Turbulence group. This group is used only to forecast turbulence not associated with a thunderstorm (thunderstorms imply severe or extreme turbulence). Omit when no turbulence is forecast.

3.3.1.3.7.1. "5". Turbulence indicator.

3.3.1.3.7.1.1. "B". Turbulence type and intensity from table 1.6. As a matter of emphasis, extreme turbulence shall be encoded with an "X".

3.3.1.3.7.1.2. hbhbhb. Forecast the height of the turbulence layer's base in hundreds of feet AGL turbulence base layers below 100 ft as "000".

3.3.1.3.7.1.3. tL. Thickness of the turbulence layer in thousands of feet AGL from table 1.5. When a layer is forecast to be thicker than 9,000 feet, repeat the icing group so that the base of the layer expressed by the second group coincides with the top of the layer given by the first. When multiple layers are forecast which are not related to each other, encode the layers in ascending order.

3.3.1.3.8. 6IchihihitL. Icing group. This group is used to forecast icing not associated with thunderstorms (thunderstorm forecasts imply moderate or greater icing). Repeat this group as often as necessary to indicate multiple icing layers. Omit when no icing is forecast.

3.3.1.3.8.1. 6. Icing indicator.

3.3.1.3.8.2. Type of icing from table 3.1. When more than one type is expected within the same stratum, encode the highest code figure.

3.3.1.3.8.3. hihihi. Height of the icing layer's base in hundreds of feet AGL from icing base layers forecasted below 100 ft shall be encoded as "000".

3.3.1.3.8.4. tL. Thickness of the icing layer in thousands of feet from table 1.5. When a layer is forecast to be thicker than 9,000 feet, repeat the icing group so that the base of the layer expressed by the second group coincides with the top of the layer given by the first. When multiple layers are forecast which are not related to each other, encode the layers in ascending order.

3.3.1.3.9. TTFTF/GFGFZ Temperature Group. This is an optional group; however, its usage is highly encouraged and should be included to meet the needs of the forecasting activity. Helicopter and VSTOL aircraft often require arrival density altitude. The forecasting activity is best suited to provide the maximum and minimum temperature and its time of occurrence.

3.3.1.3.9.1. T. Temperature indicator.

3.3.1.3.9.2. TFTF. Forecast maximum or minimum temperature, as applicable to the time of day. Encode a two digit forecast as applicable to the time of day. Encode a two digit forecast temperature in whole degrees Celsius, prefixing a minus temperature with an "M".

3.3.1.3.9.3. GFGF. The time at which the maximum or minimum temperature is expected to occur (UTC).

3.3.1.3.10. QNHPIPIPIPIINS. Lowest altimeter setting expected (in inches) during the initial forecast period and in each BECMG and FM group. Do not encode QNH in the TEMPO group.

3.3.1.3.10.1. QNH. Altimeter setting indicator.

3.3.1.3.10.2. PIPIPIPI. Forecast the lowest altimeter setting in inches.

3.3.1.3.10.3. INS. Units of measure, inches of mercury.

3.3.1.3.11. Ceiling Identification. The lowest forecast broken or overcast layer, or total obscuration, is automatically considered to be the ceiling. No ceiling remark is required.

3.3.1.3.12. Remarks. The remarks section is not intended as a "catch all" and shall not be used as a substitute for a change group.

3.3.1.3.12.1. Contractions. For weather and obstructions to vision, utilize the alphabetic abbreviations contained in table 1-2. Utilize the FAAH 7340.1, Contractions for those not contained in the table. Relate operationally significant forecast elements to geographical features whenever possible; e.g., FG OVR RIVER E.

3.3.1.3.12.1.1. Vicinity. The proximity qualifier "VC" may be used only for airmass weather when the weather is expected to occur within the local forecast area; e.g., VCSHRA W translates to rainshowers vicinity west. If the airmass weather is expected to occur within a 5 mile radius of the runway complex, it is considered to be "at the station" and the proximity qualifier "VC" shall not be used.

3.3.1.3.12.2. Last TAF. For stations that temporarily close for any duration of time, the last TAF will include the statement "LAST NO AMDS AFT YYGG NEXT YYGG" (where YY is the day of the month (UTC) and GG is the time, to the nearest whole hour (UTC).

3.3.1.3.13. TTTTT GGGeGe or TTGG. Change Groups. Change groups shall be used during the twenty-four hour forecast period when a change in some or all of the elements forecast is expected to occur at some intermediate time. Start a new line of text for each change group. Several change groups may be encoded to properly identify the forecast conditions.

3.3.1.3.13.1. FMGGgg. The time indicator TTGG in the form of "FMGGgg" shall be used to indicate the beginning of a self-contained part of the forecast indicated by the four-digit time "GGGG". When the group FMGGgg is used, all forecast conditions preceding this group are superseded by the condition forecast in this group. This forecast line shall contain all elements of a predominant forecast line. For example, if the TAF period is 0909 and a change is forecast at 1420 UTC, the entry "FM1420" shall be encoded. The elements entered on this line are in effect from 1420 UTC to the end of the forecast period, 0900 UTC. While the use of a four-digit time in whole hours, e.g., 1600, remains acceptable, a forecast and amending events may require a higher time resolution. In this case, forecast minutes should be used. Four-digit resolution will only be used in this FMGGgg group.

3.3.1.3.13.2. BECMG. The change group BECMG GGGeGe shall be used to indicate a change to forecast meteorological conditions expected to occur at either a regular or irregular rate at an unspecified time within the period identified in GG to GeGe. The duration

of the change shall normally not exceed 4 hours. This change to the predominant conditions shall be followed by a description of all elements for which the change is forecast. An element omitted from this change group would indicate that the element from the previous predominant group remains valid. The forecast conditions encoded after the BECMG GGGeGe group are those elements expected to prevail from the ending time of this change group(GeGe) to the ending time of the forecast period (G2G2) as indicated by the valid time of the TAF. When using the BECMG group to forecast a change in one or more elements, the entire element(s) must be repeated. For example, if the BECMG group was utilized to forecast a decrease in the ceiling and all other forecast layers were expected to remain the same, the entire cloud code group must be repeated, not just the ceiling layer.

3.3.1.3.13.3. TEMPO. The change group TEMPO GGGeGe group shall be used to indicate frequent or infrequent temporary fluctuations to the forecasted meteorological conditions which are expected to last less than one hour in each instance and, in the aggregate cover, less than half of the period indicated by the time GGGeGe. When the temporary conditions do not conform to the aforementioned criteria, the change group BECMG GGGeGe or FMGGgg shall be used to call for conditions different from those forecast prior to the time GGGG. To keep the forecast intent clear and unambiguous, the use of change groups should be done with care and kept to significant changes which are operationally significant to airfield operations. Overlapping of forecast periods should be avoided. Use caution when utilizing too many BECMG and TEMPO change groups between FMGGgg groups. In order to avoid confusion, keep the intent of the forecast simple.

3.3.1.3.14. Amendments/Corrections/Routine Delays. Append this group to the forecast text to identify an amended TAF (TAF AMD), corrected the TAF (TAF COR), or a routine delay TAF (TAF RTD).

3.3.1.3.14.1. TAF AMD. When issuing an amendment to the TAF, the time of the forecast beginning will be the time of the hour at which the amendment is written. The ending time shall be the valid time of the standard TAF issuance identified by G2G2. All weather elements shall be forecast for the remainder of the period covered by the amendment. TAF AMD COR shall be used when issuing a correction to the amended TAF.

3.3.1.3.14.2. TAF COR. Issue a correction to the forecast whenever any element was incorrectly transmitted or when an error has been identified. Corrections to the TAF shall not be used as replacement of a TAF AMD; e.g., if a forecast element(s) has unexpectedly changed within a short period of time after the transmission of the standard TAF, do not use the COR remark.

3.3.1.3.14.3. TAF RTD. A routine delay shall be used when the transmission of the TAF did not meet the time designated by the AWN transmission schedule.

3.3.1.3.14.4. Time of AMD or COR. The last line of the TAF shall have the time the amendment or correction was completed for transmission. Encode this time without a "Z"; e.g., AMD COR 1935.

3.3.2. Navy and Marine Corps Amendment Criteria . An amendment will be issued anytime the forecaster considers it advisable in the interest of safety, efficiency of aircraft operations, flight planning, operational control, or inflight assistance to aircraft. In determining the need for an amendment,

first consideration will be given to providing adequate advance warning of the development of conditions bearing on the safety of enroute aircraft and the adjustment of any forecast that is failing in such a way as to create a potential hazard. A more stringent criteria may be established locally based on flight control requirements and the airfield's operations manual. As a minimum, the following criteria shall be used when determining whether an amendment is needed. However, the responsibility and authority for issuing amendments shall always rest with the forecaster. Navy and Marine Corps amendment criteria are as follows:

3.3.2.1. Ceiling and/or visibility's are observed or are later forecast to increase to, equal or exceed, or decrease to less than any of the following values:

Ceiling/Visibility.

3,000 feet/3 statute miles (4800 meters).

1,000 feet/1 statute miles (1600 meters).

200 feet/1/2 statute mile (800 meters).

3.3.2.1.1. Ceiling and/or visibility's are observed or are later forecast to increase to, equal or exceed, or decrease to less than those values designated as operationally significant for local operations:

3.3.2.2. Surface Winds:

3.3.2.2.1. Wind speed change of 10 knots or more.

3.3.2.2.2. Direction change of 30 degrees or more when the mean wind speed or gusts are expected to be in excess of 15 knots.

3.3.2.2.3. Wind speed or directional change which has resulted in a change of the active duty runway

3.3.2.3. Thunderstorms:

3.3.2.3.1. A thunderstorm or tornadic activity was not forecast to occur, but later occurs or is expected to occur.

3.3.2.3.2. A thunderstorm or tornadic activity was forecast, but later is not expected to occur.

3.3.2.4. Precipitation. Precipitation that will affect safety of flight, including runway breaking action, is occurring or is forecast to occur, or if forecast, is no longer expected to occur.

3.3.2.5. Low Level Wind Shear.

3.3.2.5.1. Low level wind shear is occurring or forecast to occur, or if forecast, is no longer expected to occur.

3.3.2.5.1.1. The wind speed is, or is forecast to be ten knots or more greater than or less than originally forecast.

3.3.2.6. Minimum Altimeter (QNH). Whenever the observed altimeter falls below or is expected to fall below the forecast minimum altimeter for the applicable forecast period.

3.3.3. TAF Example and Explanation.

KNGU TAF 210909 24010KT 4800 -SN BKN005 OVC012 T01/15Z 620107 QNH3001INS

TEMPO 0915 0800 +SNRA -BLSN VV002

BECMG 1516 31012G20KT 9999 NSW SCT012 BKN250 510008 QNH3008INS

FM1845 31014G28KT 9999 SKC WS010/26040KT 510008 520804 QNH3020INS

BECMG 0506 33010KT 510804 QNH3020INS T01/15Z

Explanation:

KNGU is the ICAO identifier for NAS Norfolk, VA; TAF is the forecast designator; 210909 is the valid beginning date and time of the forecast; 24010KT is the wind group; 4800 is the prevailing visibility in meters; -SN is the w'w' for light snow; BKN005 OVC012 is the cloud code group; T01/15Z is the temperature indicating the maximum temperature will be one degree Celsius and occur at 1500 UTC; 620107 is the icing group identifying light icing in cloud, the base and top of the layer are 1,000 feet to 8,000 feet; QNH3001INS is the lowest altimeter forecast.

TEMPO 0915 is a change group with temporary fluctuation occurring between 0900 UTC and 1500 UTC; 0800 is the prevailing visibility in meters; +SNRA is the precipitation group indicating heavy snow and rain. -BLSN is an obstruction to vision group indicating light blowing snow; and VV002 is a total obscuration with the vertical visibility of 200 feet.

-BECMG 1516 is a change group identifying those elements which will become a predominant change between 1500 UTC and 1600 UTC; 31014G20KT is the wind group; 9999 is unrestricted visibility or seven miles; NSW indicates no significant weather; SCT012 BKN250 is the cloud code group; 510008 is the turbulence group indicating light turbulence, the base and the top of the layer are surface to 8,000 feet; and QNH3008INS is the lowest forecast altimeter.

-FM1845 is a change group indicating a predominant change beginning at 1845 UTC, all elements are encoded; 31014G28KT is the wind group; 9999 is unrestricted visibility or seven miles; SKC is sky clear; the base of the low level wind shear is expected at 1,000 feet with winds from 260 degrees true at 40 knots; 510008 and 520804 are turbulence groups, the first indicates light turbulence from surface to 8,000 feet, and the second is occasional moderate turbulence between 8,000 feet to 12,000 feet; and QNH3020INS is the lowest forecast altimeter.

-BECMG 0506 is a change group identifying the elements which will become predominant between 0500 UTC and 0600 UTC; 33010KT is the wind group; and 510804 is a turbulence group which identifies light turbulence, the base and the top of the layer are 8,000 feet to 12,000 feet. QNH3020INS, the lowest forecast altimeter, is included in all FM and BECMG groups. T01/15Z is the temperature indicating the maximum temperature will be one degree Celsius and occur at 1500 UTC

3.3.3.1. Miscellaneous Entries. The information provided in this paragraph is not authorized for use by NAVMETOCCOM Activities. However, the entries and their respective definitions are provided to assist the forecaster in his interpretation of the encoded elements which may be included in forecasts provided by foreign countries and other U.S. agencies. One or more of the following may be encoded:

3.3.3.1.1. CAVOK (KAV-OH-KAY). The WMO Manual states that the contraction CAVOK shall be included in place of the groups VVVV, w'w' and NsNsNshshshs/VVhshshs when all of the below listed forecast conditions exist simultaneously: Visibility: 9999 meters or 7 miles. Clouds: No cloud layers below 5,000 feet or below the highest minimum sector alti-

tude, whichever is greater, and no cumulonimbus. Weather: No precipitation, thunderstorms, shallow ground fog, or drifting dust, sand, or snow.

3.3.3.1.2. PROBC2C2 GGGeGe. PROB is the probability group indicator; C2C2 is the forecast percentage expressed in values of 30%, 40%, or 45%; and GGGeGe is the time period of the expected occurrence of the forecast elements. The probability group PROBC2C2 GGGeGe, shall be used only to forecast the probability of an occurrence of a thunderstorm or precipitation event, along with the associated weather elements whose occurrences are directly related to and contemporaneous with the thunderstorm or precipitation event. The PROB group should not be used as a modifier to the BECMG or FM groups. The PROB group shall be used to identify the range of coverage expressed in percent. The WMO regulations allow for the use of 30% and 40%; the NWS may utilize 45%. In any case, less than 30% does not justify the use of this group and 50% or more justifies the use of a BECMG, TEMPO, or FM group. The PROB group may be utilized to indicate a chance of the occurrence of thunderstorm or precipitation in a domestic forecast.

3.3.4. Limited Duty Station (LDS). LDS's have less than 24 hour per day on site forecast support. In remarks of the forecast, these stations will identify when a limited met watch support or no met watch support is available. The remark "LIMITED MET WATCH (TIME PERIOD UTC)" will be the added remark.

Notes:

1. The w'w' groups shall be constructed by considering columns 1 to 5 in the above table in sequence, i.e.,, intensity, description, then weather phenomenon.

2. No symbol is required to denote moderate intensity.

Table 3.1. Navy and Marine Corp Icing Type (Ic).

Code Figure	**Type of Icing**
0	No icing
1	Light icing
2	Light icing in cloud
3	Light icing in precipitation
4	Moderate icing
5	Moderate icing in cloud
6	Moderate icing in precipitation
7	Severe icing
8	Severe icing in cloud
9	Severe icing in precipitation

Chapter 4

SURFACE OBSERVATION CODES

4.1. Surface Synoptic Code. FMH-2, Synoptic Code, gives complete encode and decode instructions for WMO codes FM 12 (report of synoptic observations from a land station) and FM 13 (report of synoptic observations from a ship station). See AFVA 15-117 for abbreviated decoding and plotting instructions.

4.2. METAR Code. AFMAN 15-111, *Surface Weather Observations,* gives complete instructions for use of the METAR code by AFW units.

4.3. Supplementary Marine Reporting Stations Code (SMARS):

4.3.1. SMARS Format: ID WXVSB /WIND/WAVE/SEA/AIR/PRES REMARKS STATION

4.3.2. Example SMARS Report (with explanation).

24B CYR03 /NNE07/0605/54/64/3014/WEST QUODDY HEAD. Report is from West Quoddy Head Light Station (24B). Sky is cloudy (CY). Present weather is rain (R), visibility 3 miles (03). Wind is NNE at 7 knots. Sea height is 6 feet with a period of 5 seconds. Sea water temperature is 54 degrees Fahrenheit, air temperature 64 degrees Fahrenheit. Pressure is 30.14 inches.

4.3.3. Code Figure Explanation:

4.3.3.1. ID. Station Identifier

4.3.3.2. WXVSB. Sky condition, present weather, and prevailing visibility. See table 4.1 for sky condition. Standard Airways weather abbreviations are used for present weather.

4.3.3.3. Wind. True wind direction to 16 points of the compass, speed in knots.

4.3.3.4. Wave. State of sea. Average wave height between troughs and crests and save "period," or the average time between passage of two successive wave crests through a vertical reference.

4.3.3.5. SEA and AIR. Sea water and air temperature in whole degrees Fahrenheit or Celsius; minus temperatures are preceded by a minus sign.

4.3.3.6. PRES. Sea level pressure in hectopascals or inches, if available.

4.3.3.7. REMARKS. Used to provide any additional data of significance, including tides (TIDE), unusual sea conditions (SWELL), surf (SURF), outer harbor or lake conditions (OH), rainfall information (RAIN), ice conditions (ICE), and wind gusts (G).

Table 4.1. SMARS Sky Condition.

Code	Sky Condition	Sky Cover (Tenths)
CY	Cloudy	8/10 to 10/10
PC	Partly Cloudy	3/10 to 7/10
C	Clear	0/10 to 2/10

4.4. Supplementary Surface Weather Reports (SUPREP) Code. A SUPREP is a supplementary surface weather report normally made by nonweather people, usually with little or no weather observing equipment and with only limited weather training. SUPREP code is a standard NATO code.

4.4.1. SUPREP Code Format:

Notes:

1. SUPRPQ LaLaLaLoLoLo is reported when the location of the observer can be given with geographical coordinates. SUPRP9 XLXLXNXNXNXN is used when the observation point must be identified in another way.

2. Bracketed groups are optional. Significant supplementary information can be given in plain language at the end of the report.

3. The order of the groups must be maintained. Only optional groups can be omitted.

4. If an element cannot be reported it must be entered as / (or //, or ///, or ////, as appropriate).

5. The symbol "" in a code table signifies that the corresponding number is not used.

6. The group (ddff), if reported, will be given as 99ff when the windspeed is less than 5 knots.

SUPRPQ LaLaLaLoLoLo or YYGGgg NaDFVwA'HHHRTA SUPRP9 XLXLXNXNXNXN (TTPPPP) (ddff) (Nhha) (99HsPsDwWs) (Supplementary Information)

Table 4.2. Na Total Amount of Cloud.

Code Figure	**Explanation**
0	Clear
1	-
2	Scattered
3	Scattered (hills in clouds)
4	-
5	Broken
6	Broken (hills in clouds)
7	Overcast
8	Overcast (hills in clouds)
9	-

4.4.2. Specification of Symbolic Letters - SUPREP:

SUPRP	Code Identifier
Q	Octant of the globe (0=0 deg -90 deg W, 3= 0 deg -90 deg E)
LaLaLa	Latitude (tenths of degrees)
LoLoLo	Longitude (tenths of degrees)

XLXLXNXNXNXN	Arbitrary number of digits to specify position in UTM-grid or name of place, lake, road-crossing, etc.
YY	Day of month (UTC). "01" means 1st day of the month. "02"means 2nd day of the month, etc.
GGgg	Time of observation (hours and minutes UTC)
Na	Total amount of cloud (table 4.2)
D	Direction from which surface wind is blowing (table 4.3)
F	Force of surface wind (table 4.4)
V	Visibility at surface (table 4.5)
w	Present weather and obstruction to vision (table 4.6)
A'	Amplification of phenomenon reported by w (table 4.7)
HHH	Height of observation point/station above MSL in decameters.
R	State of road in vicinity of the observation point or station (table 4.8)
T	State of terrain prevailing in vicinity of observation point or station (table 4.9)
A	State of water surface (table 4.10)
TT	Air temperature in whole degrees Celsius (negative temperature encoded by adding 50 to the absolute value of the temperature; example: -20 degrees is encoded as 70).
PPPP	Pressure at observer's level in: 1. Tenths of a hectopascal; thousands of hectopascals are omitted. 2. Hundredths of inches.
dd	Direction (in tens of degrees) from which surface is blowing.
ff	Windspeed in knots (measured).
Nh	Amount of cloud reported at height ha (table 4.11)
ha	Height of lowest cloud above observation point or station (table 4.12)
99	Indicator for surf data
Hs	Average height of breakers in meters (table 4.13)
Ps	Period of breakers in seconds (table 4.14)
Dw	Direction of wave's approach to beach (Observer's back to the sea) (table 4.15)
Ws	Width of surf zone in meters (table 4.16)

Table 4.3. D Direction From Which Surface Wind is Blowing.

Code Figure	**Explanation**
0	Calm
1	NE
2	E

Code Figure	Explanation
3	SE
4	S
5	SW
6	W
7	NW
8	N
9	Variable

Table 4.4. F Force of Surface Wind (Beaufort Scale).

Code Figure	Explanation
0	Calm
1	-
2	2 (light breeze)
3	-
4	4 (moderate breeze)
5	-
6	6(strong breeze)
7	-
8	8 (gale)
9	-

Table 4.5. (WMO 4300) V Visibility at Surface.

Code Figure	Explanation
0	Less than 50 meters
1	50-200 meters
2	200-500 meters
3	500-1000 meters
4	1-2 km
5	2-4 km
6	4-10 km
7	10-20 km
8	20-50 km]
9	-

Table 4.6. w Present Weather and Obscuration.

Code Figure	Explanation
0	No significant weather
1	Smoke or haze
2	Fog in valley
3	Sandstorm, duststorm, or blowing snow
4	Fog
5	Drizzle
6	Rain
7	Snow or rain snow mixed
8	Showers
9	Thunderstorms with or without precipitation

Table 4.7. A' Amplification of Phenomenon Reported by w.

Code Figure	Explanation
0	No specification
1	Light
2	Heavy
3	In the past hour, but not at the time of observation
4	Within sight
5	Freezing precipitation
6	-
7	-
8	-
9	Hail or ice pellets

Table 4.8. R State of Road in Vicinity of Observation Point or Station.

Code Figure	Explanation
0	Dry
1	Wet
2	Flooded
3	Slush
4	Ice Patches
5	Glazed Ice
6	Snow depth 0 to 19 cm

Code Figure	Explanation
7	Snow depth 20 cm or more
8	Snow drift
9	-

Table 4.9. T State of Terrain, Prevailing in the Vicinity of the Observation Point or Station.

Code Figure	Explanation
0	Dry
1	Wet
2	Pools of water on surface
3	Flooded
4	Ground frozen 0 to 4 cm*
5	Ground frozen 5 cm or more
6	Snow depth 0 to 4 cm
7	Snow depth 5 to 24 cm
8	Snow depth 25 to 44 cm
9	Snow depth 45 cm or more

NOTE: * Use of spade possible.

Table 4.10. A State of Water Surface.

Code Figure	Explanation
0	Water level normal
1	Water level much below normal
2	Water level high, but not overflowing
3	Banks overflowing
4	Floating ice (more than half)
5	Thin ice, complete cover, impassable for persons, 0-4 cm thick
6	Ice, complete cover passable for persons, depth unknown
7	Ice, complete cover, depth 5-9 cm
8	Ice, complete cover, depth 10-24 cm
9	Ice, complete cover, depth 25 cm or more

Table 4.11. Nh Amount of Cloud Reported at Height ha.

Code Figure	Explanation
0	0
1	1/8 or less, but not 0
2	2/8
3	3/8
4	4/8
5	5/8
6	6/8
7	7/8 or more, but not 8/8
8	8/8
9	Sky obscured or cloud amount cannot be estimated.

Table 4.12. ha Height of Lowest Cloud Layer Above Observation Point or Station.

Code Figure	Explanation
0	0 to 99 meters
1	100 to 199
2	200 to 299
3	300 to 399
4	400 to 499
5	500 to 599
6	600 to 699
7	700 to 799
8	800 to 899
9	900 meters or no more cloud

Table 4.13. Hs Average Height of Breakers in Meters.

Code Figure	Explanation
0	Less than 1 meter
1	1 to 2 meters
2	2 to 3 meters
3	More than 3 meters

Table 4.14. Ps Period of Breakers (Seconds) the Time Required for Successive Breakers to Pass a Given Point.

Code Figure	Explanation
0	Less than 4 seconds
1	4 to 8 seconds
2	8 to 12 seconds
3	More than 12 seconds

Table 4.15. DW Direction of Wave's Approach to Beach (Observer's Back to Sea).

Code Figure	Explanation
0	Waves approaching from right side
1	Waves approaching directly from rear
2	Waves approaching from left side

Table 4.16. Ws Width of Surf Zone (Distance from Edge of Water to the Point Seaward That the White Caps of the Surf Begin to Appear).

Code Figure	Explanation
0	0 to 10 meters
1	10 to 20 meters
2	20 to 30 meters
3	More than 30 meters

4.5. Canadian Autostation Reports. Meteorological data are acquired from several different types of autostations in Canada and via various means of communication. Although all autostations reports are coded in either an SA or SM format, the complement of sensors may vary from one station to another, particularly between types and generations of autostations. Some parameters measured by autostations, particularly sky condition and visibility, are subject to different interpretation from an observation made by humans.

4.5.1. Symbolic Form of the National Code - Auto-station. III SA GGgg AUTOi SKY V.VI PPI PPP/TTT/TdTdTd/ddff+fmfm/AAA/RRRR appp =

4.5.2. Example Autostation Observation. WQC SA 1000 AUTO2 -X CLR BLO 50 1.6 128/ 07/ 07/0000/-/ 1001 =

4.5.3. Symbol Interpretation.

4.5.3.1. III - Station identifier

4.5.3.2. SA - hourly aviation observation.

4.5.3.3. GGgg - time of report in hours and minutes UTC.

4.5.3.4. AUTO - indicator for automatic observation.

4.5.3.5. i - type of autostation (table 4.17).

4.5.3.6. SKY - the sky condition, variable length, is reported in standard code format.

4.5.3.6.1. Heights are reported in hundreds of feet. Due to limitations of the cloud sensors, the maximum height encoded is 99. This represents a height of 9,900 feet or greater. In an autostation report, the terms CLR BLO 100 or CLR BLO 50 will be used to indicate no cloud detected below 10,000 or 5,000 feet respectively. The actual term used will depend on the limits of the sensor installed at a specific station.

4.5.3.6.2. Sky condition reports may consist of as many as four layers. Each layer belongs to a category having a range of heights, and each category is normally assigned one fixed height which is probably different from the actual height of the layer (table 4.18).

4.5.3.6.3. The AUTO2 autostations report the actual measured height of cloud detected at the time of observation versus those in table 4.18.

4.5.3.6.4. Stations equipped with both cloud and visibility sensors may report obscurations under conditions of low visibility according to table 4.19.

4.5.3.6.5. Ceilings. Autostations having measured capability will report measured height of the ceiling. Others will report W or E. W will be reported when visibility's are 0.5 miles or less and E for greater than 0.5 miles.

4.5.3.6.6. CLR means that no cloud has been detected during the past 60 minutes or more within sensor limits. Whenever CLR is reported, it will always be modified by either BLO 50 or BLO 100.

4.5.3.6.7. SCT means that the most recent cloud detected was more than 30 minutes prior to GGgg, OR cloud became insignificant in the last 10 minutes and was not detected at the time of the observation.

4.5.3.6.8. BKN means that the most recent cloud detected was 20 to 29 minutes before GGgg, OR cloud became significant in the last 10 minutes and was present at the time of observation OR cloud was detected for the past 20-49 minutes or longer, but not at the time of observation.

4.5.3.6.9. OVC means that cloud was detected for the past 50 minutes or more and was present at the time of observation.

4.5.3.7. V.VI - visibility index (not prevailing visibility) is reported in statute miles and tenths, up to 5.0 miles, then whole miles up to 9 miles. See table 4.20. **NOTE:** An autostation visibility sensor is orientated in one direction only and measures visibility over a baseline of up to 600 feet. Therefore, visibility index will not necessarily be the same as prevailing visibility.

4.5.3.8. PPI - rainfall intensity and occurrence or nonoccurrence of rainfall in the past hour. See table 4.21.

4.5.3.9. PPP - MSL pressure reported in tenths of a hectopascal, using the last three digits of the pressure and omitting the decimal point.

4.5.3.10. < - this symbol is used to indicate whether data in any group are unusual or suspect, and if so replaces the space or "/" that normally follows the group in question.

4.5.3.11. TTT - air temperature in whole degrees Celsius. A negative temperature is preceded by a minus sign.

4.5.3.12. TdTdTd - dewpoint temperature in whole degrees Celsius. A negative dew- point is preceded by a minus sign.

4.5.3.13. ddff+fmfm - wind direction, mean speed, and maximum speed.

4.5.3.13.1. dd - mean 10-minute (MAPS I stations use 2-minute mean) true wind direction from which wind is blowing.

4.5.3.13.2. ff - mean 10-minute wind speed.

4.5.3.13.3. fmfm - maximum 10-minute wind speed. Only reported if maximum speed exceeds 16 knots and it exceeds the mean speed by 5 knots. **Note:** Only supported by AUTO2 and AUTO4 stations.

4.5.3.14. AAA - altimeter setting from autostations is not approved for aviation purposes and is being reported as an "M" between two solidi. The standard format would be reported as three digits representing units, tenths, and hundredths of an inch of mercury. However, altimeter setting is reported from AUTO5 and AUTOA stations, and the standard format is three digits, representing units, tenths, and hundredths of an inch of mercury. A missing AUTO5 or AUTOA is reported as "M".

4.5.3.15. RRRR - accumulated rainfall in tenths of a millimeter since the last main synoptic observation (00, 06, 12, 18 GMT).

4.5.3.16. Remarks. The remarks group will vary in content depending on occurrence and autostation type, Some remarks are machine generated and as a result, vary in nature. Other remarks are added to the Auto report through human intervention and may vary in order. All remarks are reported between the RRRR and appp.

4.5.3.16.1. Order of priority for remarks AUTO1 to AUTO7

4.5.3.16.1.1. ICG or ICG INTMT or INTMT ICG

4.5.3.16.1.2. PCPN PAST HR

4.5.3.16.1.3. PRESFR or PRESRR

4.5.3.17. appp - station pressure tendency, reported hourly.

4.5.3.17.1. a - pressure tendency during preceding 3 hours.

4.5.3.17.2. ppp - the net amount of the station pressure change during the previous three hours reported in tenths of hectopascals.

4.5.3.18. Missing data will be reported as an "M" for each missing digit or symbol in the code.

Table 4.17. i Type of Autostation.

Code	Autostation Type
AUTO1	MARS I
AUTO2	MARS II
AUTO3	MAPS I

Code	Autostation Type
AUTO4	MAPS II
AUTO5	READAC
AUTO6	HURRICANE
AUTO7	NON-AES AUTOSTATIONS
AUTO8	OTHER AUTOSTATIONS OPERATED BY AES
AUTOA	AUGMENTED AUTO5 REPORTS

Table 4.18. Cloud Height.

Coded Height	Reported Height Categories
3	300 feet 0 to 500 feet
7	700 feet 501 to 1,000 feet
15	1,500 feet 1,001 to 2,000 feet
35	3,500 feet >2,000 feet

Table 4.19. Obscurations.

Reported Value	If Measured Visibility Is
W1 X	< 0.2
W3 X	> 0.2 < 0.5
-X	> 0.5 < 2.0

Table 4.20. V.VI Visibility Index.

Instrumented Value (Miles)	Reported Increments	Interpretation
0.0 to 1.0	0.1 mile	Measured visibility equals or
1.2 to 2.0	0.2 mile	exceeds the coded value, but is
2.5 to 5.	0.5 mile	less than the next higher
6.to 8.	1 mile	incremental value.
9.+		9 miles or more.

Table 4.21. PPI Precipitation Last Hour.

Code Figure	Interpretation
"SPACE SPACE	NIL or < 0.25 mm
P-	0.25 mm to 2.5 mm
P "Space"	> 2.5 mm to 7.5 mm
P+	> 7.5 mm

Table 4.22. Autostation Sensor Configurations.

Sensor	Autostation
Cloud	AUTO1, AUTO2, AUTO5, AUTOA
Visibility index	AUTO1, AUTO2, AUTO4, AUTO5, AUTOA
"present weather"	AUTO5, AUTOA
MSL pressure	ALL
Temperature	ALL
Dewpoint	ALL
Wind direction	ALL
Mean wind speed	ALL
Peak wind speed	ALL
Gust speed	AUTO5, AUTOA
Altimeter setting	AUTO5, AUTOA
Accumulated rainfall (6 hours)	ALL
Remarks	ALL
Pressure tendency	ALL

4.6. Automated Surface Observing Systems (ASOS). The ASOS program is a multi-agency endeavor to field up to 1700 ASOS at locations scattered throughout the country and at selected overseas military locations. These systems will operate in either unattended or augmented modes. In the augmented mode, a certified observer will provide additional information for specific weather phenomena in the remarks section of the observation. Stations transmitting observations using ASOS are identified in column 13 by the type of equipment they have and if they are being augmented or not as listed in table 4.23. The use of the contraction "AUTO" in the heading of the observation will signify the observation is fully automated with no human oversight. Overseas ASOS locations will code and report longline prevailing visibility and RVR values using the same measurement system as the local AFW unit.

Table 4.23. Types of ASOS Stations.

Column 13 Identifier	**Definition**
AO1	Automated station without precipitation discriminator.
AO2	Automated station with precipitation discriminator.

4.6.1. General Capabilities. ASOS will provide a full observation with only minor differences between it and what a manual station provides. The equipment and the algorithms have certain limitations as follows:

4.6.1.1. Sky Condition. The sky condition represents a 30-minute average of sensor outputs ranging from surface to 12,000 feet (limitation of LBC). It assumes all clouds or obscuring phenomena are opaque. Ceiling is based on all layers detected and reported as either CLR, FEW, SCT, BKN, OVC or VV (indefinite ceiling) and reports a maximum of three layers. ASOS does not evaluate for variable sky cover. Variable ceiling height is reported when the ceiling varies 200 feet or more when the ceiling is 1,000 feet or less, 400 feet or more when the ceiling is between

1,100 and 2,000 feet, and 500 feet or more when the ceiling is greater than 2,000 but less than 3,000 feet.

4.6.1.2. Prevailing Visibility. Visibility is a 10-minute average of the sensor outputs. Sector visibility is not reported and tower visibility is only reported at designated augmented stations. Variable visibility is reported when visibility varies by 1/2 mile (800 meters) or more and the average is less than 3 miles (4800 meters). Reportable values are: <1/4, 1/4, 1/2, 3/4, 1, 1 1/4, 1 1/2, 1 3/4, 2, 2 1/2, 3, 3 1/2, 4, 5, 7, and 10 statute miles. See table 1.1 for metric conversion.

4.6.1.3. Weather and Obscurations. Neither will be reported by an AO1 location. Locations with AO2 will report rain (RA), snow (SN), and a UP for cases when there is precipitation but the sensor can not determine if it is rain or snow. They will also report fog and haze.

4.6.1.4. Sea-Level Pressure. Same as manual.

4.6.1.5. Temperature and Dew Point. Same as manual.

4.6.1.6. Wind Direction and Speed. Same as manual.

4.6.1.7. Wind Character. Same as manual.

4.6.1.8. Altimeter Setting. Same as manual.

4.6.1.9. Remarks. The ASOS puts automatic remarks for variable ceiling, visibility, and wind direction, precipitation amounts, and peak wind. Remarks added by an observer are coded and reported in accordance with table 4.24.

Table 4.24. ASOS METAR Observation.

METAR KABC 121755Z AUTO 21016G24KT 180V240 1SM R11/P6000FT -RA FG BKN015 OVC025 06/05 A2990 RMK AO2 PK WND 20032/25 WSHFT 1715 TWR VIS 2 VIS 3/4V1 1/2 3/4 RWY11 RAB07 CIG 013V017 CIG 017 RWY11 PRESFR SLP125 P003 60009 T00640054 10066 21012 58033 TSNO $		
TYPE OF REPORT	METAR: Hourly (scheduled) report; SPECI: special (unscheduled) report.	METAR
STATION IDENTIFIER	Four alphanumeric characters; ICAO location identifier.	KABC
DATE/TIME	All dates and times in UTC using a 24-hour clock; two-digit date and four-digit time always appended with Z to indicate UTC.	121755Z
REPORT MODIFIER	Fully automated report, no human intervention; removed when observer signed-on.	AUTO
WIND DIRECTION AND SPEED	Direction in tens of degrees from true north (first three digits); next two digits: speed in whole knots; as needed Gusts (character) followed by maximum observed speed; always appended with KT to indicate knots; 00000KT for calm; if direction varies by 60 degrees or more, a variable wind direction group is reported.	21016G24KT 180V240

VISIBILITY	Prevailing visibility in statute miles and fractions (space between whole miles and fractions); always appended with SM in the United States to indicate statute miles; values <1/4 reported as M1/4.	1SM
RUNWAY VISUAL RANGE	10-minute RVR value in hundreds of feet; reported if prevailing visibility is ≤ one mile or RVR ≤ 6000 feet; always appended with FT in the United States to indicate feet; value prefixed with M or P to indicate value is lower or higher than the reportable RVR value.	R11/P6000FT
WEATHER PHENOMENA	RA: liquid precipitation that does not freeze; SN: frozen precipitation other than hail; UP: precipitation of unknown type; intensity prefixed: light (-), moderate (no sign), heavy (+); FG: fog; FZFG: freezing fog (temperature below 0 degrees Celsius); BR: mist; HZ: haze; SQ: squall; maximum of three groups reported; augmented by observer: FC (tornadic activity); TS (thunderstorm); GR (hail); GS (small hail; <1/4 inch); FZRA (intensity, freezing rain); and VA (volcanic ash).	-RA FG
SKY CONDITION	Cloud amount and height: CLR (no clouds detected below 12000 feet); FEW (few); SCT (scattered); BKN (broken); OVC (overcast); followed by 3-digit height in hundreds of feet; or vertical visibility (VV) followed by height for indefinite ceiling.	BKN015 OVC025
TEMPERATURE/ DEW POINT	Each is reported in whole degrees Celsius using two digits; values are separated by a solidus; sub-zero values are prefixed with an M (minus)	06/05
ALTIMETER	Altimeter always prefixed with an A indicating inches of mercury; reported using four digits: tens, units, tenths, and hundredths.	A2990

REMARKS INDICATOR: RMK	**RMK**
TORNADIC ACTIVITY: Augmented report should include TORNADO, FUNNEL CLOUD, or WATERSPOUT, time begin/end, location, movement, e.g., TORNADO B25 N MOV E.	
TYPE OF AUTOMATED STATION: AO2; automated station with precipitation discriminator.	AO2
PEAK WIND: PK WND dddff(f)/(hh)mm; direction in tens of degrees, speed in whole knots, and time	PK WND 20032/25
WIND SHIFT: WSHFT (hh)mm	WSHFT 1715
TOWER OR SURFACE VISIBILITY: TWR VIS vvvvv: visibility reported by tower personnel; SFC VIS vvvvv: visibility reported by ASOS.	TWR VIS
VARIABLE PREVAILING VISIBILITY: VIS vvvvvVvvvvv; reported if prevailing visibility is <3 miles and variable.	VIS 3/4V1 1/2

REMARKS INDICATOR: RMK	**RMK**
VISIBILITY AT SECOND LOCATION: VIS vvvvv (LOC); reported if different than the reported prevailing visibility in body of report.	VIS 3/4 RWY11
LIGHTNING: (FREQ) LTG (LOC); when detected , the frequency and location is reported, e.g., FRQ LTG NE.	
BEGINNING AND ENDING OF PRECIPITATION AND THUNDERSTORMS: w'w'B(hh)mmmE(bb)mm; TSB(hh)mmE(hh)mm	RAB07
VIRGA: Augmented; precipitation not reaching the ground, e.g., VIRGA	
VARIABLE CEILING HEIGHT: CIG hhhVhhh; reported if ceiling in body of report is < 3000 feet and variable.	CIG 013V017
CEILING HEIGHT AT SECOND LOCATION: CIG hhh (LOC); Ceiling height reported if secondary ceilometer site is different from the ceiling height in the body of the report.	CIG 017 RWY11
PRESSURE RISING OR FALLING RAPIDLY: PRESRR or PRESFR; pressure rising or falling rapidly at time of observation.	PRESFR
SEA-LEVEL PRESSURE: SLPppp; tens, units, and tenths of SLP in hPa.	SLP125
HOURLY PRECIPITATION AMOUNT: Prrrr; in .01 inches since last METAR; a trace is P0000.	P0003
3- AND 6-HOURLY PRECIPITATION AMOUNT: 6RRRR; precipitation amount in .01 inches for past 6 hours reported in 00, 06, 12, and 18 UTC observations and for the past 3 hours in 03, 09, 15, and 21 UTC observations, a trace is 60000.	60009
24-HOURLY PRECIPITATION AMOUNT: $7R_{24}R_{24}R_{24}R_{24}$: precipitation amount in .01 inches for past 24 hours reported in 12 UTC observations, e.g., 70015	
HOURLY TEMPERATURE AND DEW POINT: T_STTT_STTT; tenths of degrees Celsius; "s": 1 if temperature below 0 degrees and 0 if temperature is 0 degrees or higher	T00640054
6-HOUR MAXIMUM TEMPERATURE: $1s_nT_xT_xT_x$: tenth of degree Celsius; 00, 06, 12, 18 UTC; "sn": 1 if temperature below 0 degrees and 0 if temperature is 0 degrees or higher	10066
6-HOUR MINIMUM TEMPERATURE: $2s_nT_nT_nT_n$: tenth of degree Celsius; 00, 06, 12, 18 UTC; "s_n": 1 if temperature below 0 degrees and 0 if temperature is 0 degrees or higher	21012
24-HOUR MAXIMUM AND MINIMUM TEMPERATURE: $4s_nT_xT_xT_xs_nT_nT_nT_n$: tenth of degree Celsius; reported at midnight local standard time; 1 if temperature below 0 degrees and 0 if temperature is 0 degrees or higher, e.g., 400461006	
PRESSURE TENDENCY: 5appp; the character (a) and change in pressure (ppp; tenths of hPa) the past 3 hours.	58033

REMARKS INDICATOR: RMK	**RMK**
SENSOR STATUS INDICATORS: RVRNO: RVR missing; PWINO: precipitation identifier information not available; PNO: precipitation amount not available; FZRANO: freezing rain information not available; TSNO: thunderstorm information not available; VISNO (LOC); visibility at secondary location not available, e.g., VISNO RWY06; CHINO (LOC): (cloud-height-indicator) sky condition at secondary location not available, e.g., CHINO RWY06.	TSNO
MAINTENANCE CHECK INDICATOR: Maintenance needed on the system	$

NOTE:

If an element or phenomena is missing, or cannot be observed, the corresponding group and spaces are omitted (body and/or remarks) from that particular report, except for Sea-Level Pressure (SLPppp). SLPNO shall be reported in a METAR when the SLP is not available.

Chapter 5

AIRCRAFT OBSERVATION CODES

5.1. Scope . This chapter contains instructions for manual encoding and dissemination of pilot reports (PIREPs) and air reports (AIREPs) in a standard format which facilitates processing, transmission, storage, and retrieval of reports of in-flight weather occurrences. To assure consistent understanding, standard meteorological contractions shall be used in the reporting of in-flight weather phenomena. Where possible, authorized contractions and abbreviations from table 5.1 and attachment 1 shall be used. Although the reporting of some elements in a PIREP are optional, the disseminated report shall be in accordance with this chapter.

5.2. Pilot Report (PIREP) Code . Appropriate data received from a pilot either in the air or on the ground, or relayed from a reliable source on the ground, shall be placed in a standard format for dissemination. Each report shall identify the type of report and each element in the report by a text element indicator (TEI) and include, as a minimum, entries for message type, location, time, flight level, type of aircraft, and at least one other element. The PIREP will describe the phenomena location with reference to a VHF NAVAID or four-letter airport or location identifiers and use only authorized contractions and aircraft designators as listed in FAAH 7340.1, Contractions. Where plain language is called for, authorized contractions and abbreviations should be used. However, in no case should an essential remark be omitted due to lack of readily available contractions. Omit TEIs for unreported or unknown elements except for the mandatory entries of message type, location, time, flight level, type of aircraft, and at least one other element. If a mandatory TEI entry is unknown, enter "UNKN" for the missing mandatory element. Encode PIREPs in the following format and document on AF Form 3805, Pilot Report (see paragraph 5.2.14.)

PIREP Format

UUA_or UA /OV_(location)/TM_(time)/FL(flight level)/TP_(type of aircraft)/SK_(sky cover)/ WX_(weather)/TA_(temperature)/WV_(winds)/TB_(turbulence)/IC_(icing)/RM_(remarks).

Note that each TEI is preceded by a solidus (/) and, except for flight level, followed by a space. The underline "_" is used for illustration purposes only to indicate a required space. In the individual TEI sections which follow, the information enclosed in parentheses ( ) depict the format of optional entries.

5.2.1. Message Type (UUA or UA). Indicates that an urgent (UUA) or routine (UA) pilot report follows. "UUA" shall be used whenever any of the following are reported:

5.2.1.1. Hail (GR or GS).

5.2.1.2. Low Level Wind Shear (LLWS - air speed fluctuations of 10 knots or more within 2,000 feet of surface. Air speed fluctuating less than 10 knots is a routine PIREP).

5.2.1.3. Severe icing.

5.2.1.4. Severe or extreme turbulence, including Clear Air Turbulence (CAT).

5.2.1.5. Tornado, funnel cloud, or waterspout (FC).

5.2.1.6. Volcanic Eruption and/or Ash (VA) when reported by any source, in the air or on the ground.

5.2.1.7. Any condition that, in the judgment of the person entering the PIREP into the system, would present an extreme hazard to flight.

5.2.2. Location (/OV). After the TEI, describe the point at which, or the line along which, the reported phenomenon or phenomena occurred by reference to a VHF NAVAID(s) or an airport using the four-letter location identifier. (NOTE: some weather processing systems may drop the leading "K", "P", or "H" on the location identifier and display only the 3-letter identifier). If appropriate, the identifier is followed by the radial bearing and distance from the NAVAID. Using three-digits each, indicate the magnetic bearing direction in degrees followed by the distance in nautical miles.

5.2.2.1. FORMAT: /OV_LOC/AIRPORT or NAVAID(RRRDDD)(-AIRPORT or NAVAID(RRRDDD). LOC/AIRPORT or NAVAID is the four-letter location identifier for the airport or four-letter identifier for the VHF NAVAID. RRR and DDD are the magnetic bearing and distance from the location, respectively. Notice the lack of a space between location and RRRDDD and also before and after the hyphen when two AIRPORTS/NAVAIDs are reported. Contractions, such as DURGC, or statements, such as AT TOP OF CLIMB, shall not be used in this field, but may be added as Remarks (/RM).

Examples:

Pilot Reports Location as:	Encode:
Over Kennedy Airport, NY	/OV_KJFK
Departing Hannibal, MO.	/OV_KHAE
Along route from St. Louis to Kansas City, MO.	/OV_KSTL-KMKC
30 east of St. Louis VORTAC to 15 northeast of Kansas City VORTAC	/OV_KSTL090030-KMKC045015

5.2.3. Time (/TM). Enter the UTC time, GGgg, in hours and minutes, as given by the pilot, when the reported phenomenon or phenomena occurred or was encountered. If a span of time is reported, encode the midpoint; for example, if the report is for 1845Z to 1935Z, encode the midpoint, 1910Z as "1910".

5.2.3.1. FORMAT: /TM_GGgg

5.2.4. Flight Level (/FL). The aircraft's altitude (flight level), HHH, shall be entered in hundreds of feet above mean sea level (MSL) when the phenomenon or phenomena was first encountered, or if the altitude is unknown, enter UNKN. If an aircraft was climbing or descending, enter the appropriate contraction (DURGC or DURGD) in the remarks section. If the condition was encountered within a layer, enter the altitude range of the layer within the appropriate phenomenon TEI. NOTE: There is no space between the "FL" TEI and the altitude.

5.2.4.1. FORMAT: /FLHHH(-HHH)

5.2.5. Type of Aircraft (/TP). If the type of aircraft is unknown, enter UNKN; otherwise enter the aircraft type designator, i.e., B737, F4, etc. The proper coding of this TEI is critical for the accurate interpretation and utilization of PIREPs, in particular those of icing or turbulence. FAAH 7340.1, Contractions, Chapter 5, "Civil/Military Aircraft Type Designators," provides all recognized aircraft designators for use in PIREPs as agreed to between the FAA and ICAO. The type designators are limited to four alphanumeric characters. If not known, enter UNKN.

5.2.5.1. FORMAT: /TP_AAAA or /TP_UNKN

5.2.6. Sky Cover (/SK). A PIREP may include the Sky Cover TEI. Enter the cloud cover contraction followed by heights of bases and tops as reported by the pilot. For each layer, enter the heights of clouds in hundreds of feet above mean sea level (MSL) in three-digits and use the cloud cover contractions SKC, FEW, SCT, BKN, or OVC. If cloud cover amounts range between two values, separate the contractions with a hyphen and no spaces (e.g., BKN-OVC). Indicate unknown heights by using UNKN. If the pilot reports he/she is in clouds, enter OVC. When more than one layer is reported, separate layers by a solidus (/). NOTE: There are no spaces between heights and cloud cover contractions.

5.2.6.1. FORMAT: /SK_$N_sN_sN_s$(-$N_sN_sN_sN_s$)$h_bh_bh_b$-h_th_tht/$N_sN_sN_s$(-$_sN_sN_sN_s$)$h_bh_bh_b$-$h_th_th_t$, etc.). "$N_sN_sN_s$" is the three letter contraction for the amount of cloud cover, "$h_bh_bh_b$" is the height of the base of a layer of clouds in hundreds of feet, and "hththt" is the height of the top of the layer in hundreds of feet. Thus, the code form for cloud amount, base, and tops becomes NsNsNshbhbhb-hththt.

Examples: /SK_OVC100-110
/SK_OVC065-UNKN
/SK_SCT-BKN050-100
/SK_BKN-OVC025-060/BKN120-150/SKC
/SK_OVC015-035/OVC230
/SK_FEW030
/SK_SKC

5.2.7. Weather (/WX). PIREPs may include flight visibility and/or flight weather in this TEI.

5.2.7.1. Flight visibility (FV) - If reported by the pilot, flight visibility will be the first entry in the "/WX" field. It shall be entered as FV followed immediately (no space) by the two-digit visibility value rounded, if necessary, to the nearest whole statute mile (SM). When a flight visibility value is reported, append "SM" to the value (e.g., FV03SM). FV99SM will be used to enter a report of unrestricted flight visibility. Overseas units using metric system visibility values will encode in kilometers. Unrestricted visibility will be encoded as "FV99". When the value being rounded down becomes operationally significant, consider adding a clarifying comment in the remarks section. For example a report of 1/2 SM (above airfield minimums) mile visibility would be rounded down and reported as FV00SM (below minimums); append in remarks the comment "IN FLT VIS 1/2 SM." Leave out if unknown or not reported.

5.2.7.2. Weather - Enter one or more of the listed weather types in table 5.1, using the appropriate METAR contraction.

NOTES:

1. FC is entered in the /WX Weather TEI and FUNNEL CLOUD is spelled out in the /RM Remarks TEI. +FC is entered in the /WX Weather TEI and TORNADO or WATERSPOUT is spelled out in the /RM Remarks TEI.
2. If the size of hail is known, enter in 1/4 inch increments in the /RM Remarks TEI.

Table 5.1. PIREP Flight Weather Contractions.

Weather	**METAR Encode**
Funnel Cloud (see note 1)	FC
Tornado/Waterspout (see note 1)	+FC
Thunderstorm	TS
Fog (visibility less than 5/8 SM or 1000 meters)	FG
Mist (visibility greater than or equal to 5/8 SM or 1000 meters)	BR
Rain/Rainshowers	RA/SHRA
Drizzle	DZ
Squall	SQ
Freezing Rain	FZRA
Freezing Drizzle	FZDZ
Hail 1/4 inch diameter or larger (see note 2)	GR
Hail Shower (See Note 2)	SHGR
Small Hail/Snow Pellets (less than 1/4 inch diameter)	GS
Small Hail Showers/Snow Pellet Showers	SHGS
Ice Pellets/Ice Pellet Showers	PE/SHPE
Snow/Snow Showers	SN/SHSN
Drifting Snow	DRSN
Blowing Snow	BLSN
Snow Grains	SG
Dust	DU
Drifting Dust	DRDU
Blowing Dust	BLDU
Duststorm	DS
Sand	SA
Drifting Sand	DRSA
Blowing Sand	BLSA
Sandstorms	SS

Weather	METAR Encode
Well Developed Dust/Sand Whirls	PO
Haze	HZ
Smoke	FU
Volcanic Ash	VA
Spray	PY

5.2.7.2.1. If more than one form of precipitation is combined in the report, the dominant type shall be reported first. The proximity qualifier VC (Vicinity) may be used in combination only with the abbreviations TS, FG, SH, PO, BLDU, BLSA, and BLSN. Intensity (- for light, no qualifier for moderate, and + for heavy), shall be indicated with precipitation types, except ice crystals and hail, including those associated with a thunderstorm and those of a showery nature. Tornadoes and waterspouts shall be coded as +FC. No intensity shall be ascribed to the obscurations of blowing dust, blowing sand and blowing snow. Only moderate or heavy intensity shall be ascribed to duststorm and sandstorm.

5.2.7.3. Weather layers (i.e., fog, haze, smoke or dust) shall be entered with the base and/or top of the layer, if reported, encoded in the same manner as cloud cover in the /SK field (e.g., FU002-030). If more than one type of weather is reported, the types shall be reported in the following order: (1) Tornado, Funnel Cloud, or Waterspout (2) Thunderstorm with or without associated precipitation (3) Weather phenomena in order of decreasing predominance, i.e., the most dominant reported first. Separate groups shall be used for each type of weather or thunderstorm, and no more than three groups shall be reported in one PIREP. Coding present weather and the use of qualifiers/descriptors is based on Federal Meteorological Handbook 1 (FMH-1) for METAR. Further details are found in AFMAN 15-111, *Surface Weather Observations.*

5.2.7.4. FORMAT: /WX_(FVvvSM_)ww(_ww)(_ww). The "vv" is the two-digit flight visibility value and "ww" is the variable length encoded flight weather.

Examples:	/WX_FV02SM_BRHZ000-083	In remarks enter BR TOP 009
	/WX_FV00SM_+TSRAGR	
	/WX_FV99SM	
	/WX_FV02SM_VA330	
	/WX_FC	In remarks enter FUNNEL CLOUD
	/WX_+FC	In remarks enter TORNADO, or WATERSPOUT
	/WX_BCFG_VC_W	(Decoded: Patches of fog between 5 and 10 SM of the report location to the west)

5.2.8. Temperature (/TA). If temperature is reported, it shall be the outside air temperature, using two digits, in whole degrees Celsius. Sub-zero temperatures shall be prefixed with an "M"; for example, a temperature of -2 degrees Celsius shall be coded /TA_M02.

5.2.8.1. FORMAT: /TA_(M)T'T'. T'T'" is the two-digit temperature value in whole degrees Celsius.

5.2.9. Wind Direction and Speed (/WV). If reported, wind direction from which the wind is blowing shall be coded in tens of degrees using three figures. Directions less than 100 degrees shall be preceded by a "0", for example, a wind direction of 90o is coded as 090. The wind speed (spot wind) shall be entered as a two or three digit group immediately following the wind direction. The speed shall be coded in whole knots using the hundreds digit (if not zero) and the tens and units digits. The wind group always ends with "KT" to indicate that winds are reported in knots. Speeds of less than 10 knots shall be coded using a leading zero. For example, a wind speed of 8 knots shall be coded 08KT. A wind speed of 112 knots shall be coded 112KT.

5.2.9.1. FORMAT: /WV_dddff(f)KT. The "ddd" is the three-digit true direction, in whole degrees, from which the wind is blowing; and "ff(f)" is the wind speed in knots, followed by "KT".

Example:/WV 26030KT (Decoded: Wind 260 degrees at 30 knots)

/WV 080110KT (Decoded: Wind 080 degrees at 110 knots)

5.2.10. Turbulence (/TB). If reported, intensity, type, and altitude of turbulence are entered as follows:

5.2.10.1. Intensity. This is the first element reported after the space following the TEI. The reportable intensities are LGT, MOD, SEV, and EXTRM. HVY is not a reportable intensity. A range or variations in intensity shall be entered as two values separated by a hyphen (e.g., MOD-SEV). If turbulence was forecast at any level, but none was encountered, enter NEG in the /TB field.

5.2.10.2. Type. May be blank, or enter either CAT or CHOP, if reported by the pilot. "CAT" is Clear Air Turbulence. This type of turbulence is encountered in air where no clouds are present and is commonly applied to high-level turbulence associated with wind-shear, often in the vicinity of the jet stream. CAT intensity may be light, moderate, severe, or extreme. "CHOP" turbulence causes rapid and somewhat rhythmic jolts or bumpiness without appreciable changes in altitude or attitude and may be indicated as either light or moderate. Never report CHOP as SEV or EXTRM.

5.2.10.3. Altitude. Enter the reported turbulence altitude only if it differs from the value reported in /FL, or is reported as a layer with defined or undefined boundaries. When entering a layer use a hyphen between height values. Undefined lower and higher boundary limits are entered as BLO or ABV. Use a solidus to separate two or more layers of turbulence.

5.2.10.4. FORMAT: /TB_III(-III)(_CAT or CHOP_)_($h_bh_bh_b$-$h_th_th_t$)/III(-III) etc. The "III" is the intensity of the turbulence and CAT or CHOP are the only two entries for type of turbulence permitted. hbhbhb is the base of the turbulence layer, if defined, or BLO or ABV, if undefined; and hththt is the top of a defined layer or the boundary of an undefined layer.

Examples: /TB_EXTRM_350
/TB_MOD-SEV_BLO_080
/TB_LGT_035
/TB_LGT-MOD_CHOP_310-350
/TB_NEG
/TB_MOD_CAT_ABV_280/NEG_220-280

5.2.11. Icing (/IC). If reports of icing are received, enter these icing reports using the same format used to report turbulence; i.e., intensity, type, and altitude(s) of icing conditions.

5.2.11.1. Intensity. Enter TRACE, LGT, MOD, SEV, or ranges covering two values separated by a hyphen. HVY is not a reportable intensity. If icing was forecast any level, but none was encountered, enter NEG.

5.2.11.2. Type. Enter the reported icing types as: RIME, CLR (Clear), or MX (Mixed).

5.2.11.2.1. RIME - Rough, milky, opaque ice formed by the instantaneous freezing of small supercooled water droplets.

5.2.11.2.2. CLR (Clear) - Glossy, clear, or translucent ice formed by the relatively slow freezing of large supercooled water droplets.

5.2.11.2.3. MX (Mixed) - A combination of rime and clear icing.

5.2.11.3. Altitude. Enter the reported icing altitude only if it differs from the value reported in /FL, or is reported as a layer with defined or undefined boundaries. When entering a layer use a hyphen between height values. Undefined lower and higher boundary limits are entered as BLO or ABV. Use a solidus to separate two or more layers of icing.

5.2.11.4. FORMAT: /IC_III(-III)_(type)_($h_bh_bh_b$-$h_th_th_t$)/III(-III)_etc. The "III" is the intensity of the icing; type is one of the three listed icing types; hbhbhb is the base of the icing layer, if defined, or BLO or ABV, if undefined; and $h_th_th_t$ is the top of a defined layer or the boundary of an undefined layer.

Examples: /IC_TRACE_RIME
/IC_LGT-MOD_RIME_085
/IC_MOD_MX_035-070
/IC_LGT_CLR_015-045/SEV_CLR_ABV_075
/IC_NEG

5.2.12. Remarks (/RM). Data or phenomena following this TEI are considered significant, however, they do not fit in any previously reported TEI, or if they further define entries in other TEIs. The following phenomena may be reported when encountered by pilots. Enter heights only if they differ from /FL.

5.2.12.1. Wind Shear. Low Level Wind Shear is defined as rapid air speed fluctuations within 2,000 feet of the earth's surface. When the fluctuation in airspeed is 10 knots or more, the report is classified as an Urgent (UUA) PIREP. When Low Level Wind Shear (LLWS) is a reason for issuing an Urgent PIREP, or whenever it is included as an element in any PIREP, enter LLWS as the first remark immediately after the /RM TEI, i.e., /RM LLWS_-15KT_SFC-003_DURGC_RY22_JFK. LLWS may be reported as -, +, or +/-, depending on the effect of the phenomena on the aircraft. If the location of the LLWS encounter is different from the /OV or /FL fields, then include this information in remarks using the same format(s).

5.2.12.2. FUNNEL CLOUD, TORNADO, and WATERSPOUT. Enter the appropriate term followed by the direction of movement, if reported, otherwise the entries in the "/OV" and "/WX" sections will be sufficient.

5.2.12.3. Thunderstorm. Enter areal coverage descriptions (ISOL, FEW, SCT, NMRS), or if storms are reported in a line, enter description (LN, SCT LN, BKN LN, SLD LN), if known. Follow the areal coverage description with the contraction TS, the location and movement of storms, and type of lightning, if known.

5.2.12.4. Lightning. Enter frequency (OCNL, FRQ, CONS), followed by type, i.e., LTGIC, LTGCC, LTGCG, LTGCA or combinations, as reported by the pilot.

5.2.12.5. Electric Discharge. Enter DISCHARGE, followed by altitude.

5.2.12.6. Contrails. Enter CONTRAILS followed by their height if different from the "/FL" height.

5.2.12.7. Cloud Reports. Heights of bases and tops encountered shall be reported in /SK. This remarks section is used for clouds that can be seen but were not encountered during flight, such as CS W, OVC BLO, SCT-BKN ABV, CB E MOV NE, etc.

5.2.12.8. Language and Terminology. Some information may be reported by the pilot in non-standard or uncodable terminology; e.g., very rough, bumpy. If specified phraseology is not adequate, use plain language to enter a description of the phenomena as clearly and concisely as possible. Appropriate remarks made by the pilot which do not fit in any TEI may also be included in remarks section. Some remarks that fall into this category are DURGC, DURGD, RCA, TOP, TOC, or CONTRAILS.

5.2.12.9. Volcanic Eruption. Volcanic Eruption shall be indicated in the remarks section of an urgent PIREP. (Volcanic ash alone is considered weather phenomena and is included in TEI/WX.) A report of volcanic activity shall include as much information as possible, such as the name of the mountain, time of observed eruption (if different from /TM entry), location, and any ash cloud observed with the direction of the ash cloud movement. If the report is received from other than a pilot in the air or on the ground, enter aircraft "UNKN", flight level "UNKN", and indicate in Remarks that the report is "UNOFFICIAL".

5.2.12.10. PIREP Source. For further identification of the source of a PIREP, the aircraft identification, call sign, or registration number may be added to the Remarks.

5.2.12.10.1. The facility encoding the PIREP may be added to the end of the Remarks element, e.g., ZLA CWSU”

5.2.13. AF Form 3805 Entries . To facilitate formatting of the PIREP, locally developed procedures may be utilized prior to dissemination based upon these instructions.

5.2.13.1. Dissemination. Pilot reports may be sent individually or as part of a collective/bulletin. All pilot reports should be given local and longline dissemination as a PIREP, except:

5.2.13.1.1. When two or more reports have substantially the same information, disseminate only the most recent. A remark may be included to indicate numerous reports of the same phenomena were received, e.g., “MULTIPLE RPTS”, NUMEROUS ACFT.”

5.2.13.1.2. When reports of sky condition have been incorporated into a METAR or SPECI observation, unless deemed appropriate by the person entering the report.

5.2.13.1.3. Hazardous Phenomena. Precede severe PIREPs (see paragraph 5.2.1) with UUA.

5.2.13.1.4. Precede all other PIREPs with "UA".

5.2.13.1.5. Examples:

5.2.13.1.5.1. Clear-air Turbulence. A Boeing 757-200 pilot reports severe clear-air turbulence between 35,000 and 39,000 feet over Toledo: UUA/OV_TOL/TM_2200/FLUNKN/TP_B757/TB_SEV_CAT_350-390

5.2.13.1.5.2. Duststorms or Sandstorms. A pilot reports a duststorm 35 miles northeast of Midland, Texas, flying at 4,000 feet with a visibility of 3/4 of a mile: UA/OV_MAF045035/TM_0750/FL040/TP_UNKN/WX_FV01SM_DS

5.2.13.1.5.3. Electric Discharge. A military pilot flying a Lockheed Orion between Richmond, Virginia, and Washington, DC, reports that the aircraft experienced an electrical discharge 20 miles south of Washington at an altitude of 5,000 feet: UA/OV_DCA180020/TM_2120/FL050/TP_P3/RM_DISCHARGE

5.2.13.1.5.4. Smoke Layer. A pilot of a Dehavilland 7 reports that there is a smoke layer from 2,000 to 6,500 feet over the field at Pittsburgh: UA/OV_PIT/TM_1500/FLUNKN/TP_DH7/WX_FU020-065

5.2.13.1.5.5. Hail. The pilot of a Fairchild F27 reports moderate hail, 1/2" in diameter, 10 miles south of Omaha, Nebraska at an altitude of 3,500 feet: UUA/OV_OMA180010/TM_2217/FL035/TP_FA27/WX_GR/RM HLSTO 1/2"

5.2.13.1.5.6. Icing. The pilot of a Seneca reports moderate rime icing was encountered 5 to 20 miles north of Eugene, Oregon, at 2,000 feet: UA/OV_EUG360005-360020/TM_1500/FL020/TP_PA34/IC_MOD_RIME

5.2.13.1.5.7. Cloud Cover. The pilot of a Shorts 360 reports broken clouds between 3,600 feet and 6,600 feet, 6 miles SE of Honolulu. At 7,000 feet the pilot is between layers with an overcast deck above: UA/OV_HNL135006/TM_0000/FL070/TP_SH36/SK_BKN036-066/UNKN_OVC_ABV

5.2.13.1.5.8. Thunderstorm. A pilot reports a broken line of thunderstorms 45 miles NW of Dodge City in a north-south direction. Broken TCU cloud bases are at 3,000 feet with the layer tops at 15,000 feet and CB tops at 32,000 feet. Occasional cloud to cloud and cloud to ground lightning is observed. Type of aircraft is a McDonnell-Douglas DC-9/80: UA/OV_DDC315045/TM_2224/FLUNKN/TP_MD8/SK_BKN030-150/WX_TS/RM_LN_TS_N-S_OCNL_LTGCCCG_CB_TOPS_320

5.2.13.1.5.9. Tornado. A pilot 35 miles north of Champaign, Illinois reports a tornado moving east northeast. The cloud layer is broken with bases at 3,000 feet. The tornado is observed to be making intermittent contact with the ground: UUA/OV_CMI360035/TM_2314/FLUNKN/TP_UNKN/SK_BKN030/WX_+FC/RM_TORNADO_MOV_ENE_INTER_CTC_W_GND

5.2.13.1.5.10. Turbulence (not clear air). The pilot of a Convair 580 flying at 10,000 feet through Donner Summit Pass reports to Reno, Nevada, that light turbulence is being encountered: UA/OV_RNO250035/TM_1850/FL100/TP_CV58/TB_LGT/RM Donner Summit Pass

5.2.13.1.5.11. Wind. The military pilot of a OV1 Mohawk has encountered an 82-knot wind 30 miles west of Bismark at 6,000 feet MSL, true wind direction 80 degrees: UA/OV_BIS270030/TM_1445/FL060/TP_OV1/WV_080082KT.

5.2.13.1.5.12. Volcanic Eruption and/or Ash. The pilot of a McDonnell Douglas DC10 at 37,000 feet, 75 miles Southwest of Anchorage, reports Mt. Augustine erupted at 2008Z. The pilot also reports an ash cloud 40 miles south of the volcano, moving south-southeast: NOTE: A report of volcanic eruption/volcanic ash may be received from any source. If the source is other than a pilot in the air or on the ground, the remark section will begin with "UNOFFICIAL. UUA/OV_ANC240075/TM_2010/FL370/TP_DC10/WX_VA/RM_VOLCANIC ERUPTION_2008Z_MT_AUGUSTINE_ASH_40S_MOV_SSE

5.3. Air Report (AIREP) Code.

5.3.1. In-flight weather reports are recorded on AF Form 72, Air Report (AIREP). Unless otherwise specified, these reports are not prepared within the contiguous US and along routes where a navigator is not required. AIREPs are used by receiving weather stations and transmitted to computer centers for use in preparation of computer flight plans.

5.3.2. The code breakdown for a complete in-flight weather report follows:

CCCC	Station identifier.
AIREP type	ARP (Routine) or ARS (AIREP Special); see table 5.5. Will precede all AIREP text.
Aircraft Number	Reported as a seven-character group. The identifier will be a combination of numbers and letters.
Latitude	Four figures indicating the latitude of the aircraft to the nearest minute followed by the letter "N" (North) or "S" (South).
Longitude	Five figures indicating the longitude of the aircraft to the nearest minute followed by the letter "E" (East) or "W" (West).
UTC Time	Four figures depicting time to the nearest minute. Flight Level A four-character group (the letter "F" followed by three figures), representing the aircraft altitude in hundreds of feet; e.g., F370.

(Reports which have not been edited will include next position data information at this point in the code in the following format: Five-character latitude group, six-character longitude group, and a four-figure arrival time group. These data will not be transmitted by stations.)

TEMP	Two figures indicating the temperature in whole degrees Celsius preceded by P" (plus) or "M" (minus).
Weather	Three-figure code for H-Hazard Code (table 5.2), W-Weather Code (table 5.3), and F-Flight Conditions (table 5.4)

Wind	A five-figure wind group. The first two figures indicate true wind direction in tens of degrees. The last three figures indicate wind speed to the nearest knot. In the following code: DD= True wind direction at current position.
FFF	= Wind speed at current position.
Remarks	Includes aircraft type when turbulence is reported in the weather group. Air refueling (AR) may also be included by indicating AR followed by one letter to indicate use of track and one figure to indicate visibility (table 5.6)
Debrief Remarks	Certain aircraft will provide debrief remarks on the backside of the AF Form 72. These remarks will always be included in the AIREP.
CCCC CCCC	ICAO (Departure) - ICAO (Destination).
GGgg GGgg	Time (UTC) of actual take-off and landing.
FWF	Forecast wind factor, negative = M, positive = P.
AWF	Actual wind factor, negative = M, positive = P.
RWF	Revised wind factor, negative = M, positive = P.
ACFT TYPE	Not needed if reported elsewhere.
FL	Actual flight levels flown.
CFPI	Computer flight plan number.

5.3.3. Edit reports longline before transmission to delete addressee and next position data. Insert solidi (/) for missing characters. Examples of AIREP (AF Form 72) entries and the resultant weather messages follow:

5.3.3.1. AIREP From AF Form 72:

ARP MA00146 4949N 03000W 0204 F370 5040N 02045W 0249 M55 221 03069 ARG3

KC135 KDOV EDAR 07/0030Z 07/0627Z CFPI 00710524.9Z FWF 25 AWF 33 270/330

290/330

Reported as:

EDAR ARP MA00146 4949N 03000W 0204 F370 M55 221 03069 ARG3 KC135 KDOV EDAR

0030 0627 FWF P25 AWF P33 FL270/330 CFPI 00710524.9

5.3.3.2. AIREP From AF Form 72:

ARS MA00153 4951N 05010W 0510 F350 5052N 06012 W 0705 M48 147 26030 C5

TS TOPS 450

Reported as:

CCCC ARS MA00153 4951N 05010W 0510 F350 M48 147 26030 C5 TS TOPS 450

Table 5.2. AIREP Hazard (H).

Code Figure	Explanation
0	None
1	Light Turbulence
2	Moderate Turbulence
3	Severe Turbulence
4	Extreme Turbulence
5	Trace of Icing
6	Light Icing
7	Moderate Icing
8	Heavy (Severe) Icing
9	Hail

Table 5.3. AIREP Weather (w).

Code Figure	Explanation
0	Clear
1	Scattered Clouds
2	Broken Clouds
3	Continuous Layers
4	Lightning
5	Drizzle
6	Continuous Rain
7	Continuous Snow
8	Rain or Snow Showers
9	Thunderstorm

Table 5.4. AIREP Flight Condition (Fc).

Code Figure	Explanation
0	Clear
1	Scattered Clouds
2	Broken Clouds
3	Continuous Layers
4	Lightning
5	Drizzle
6	Continuous Rain

Code Figure	Explanation
7	Continuous Snow
8	Rain or Snow Showers
9	Thunderstorm

Table 5.5. Meteorological Conditions Requiring AIREP Special (ARS).

Thunderstorms	Severe Icing
Tropical Storm	Severe or Extreme Turbulence
Squall Line	Marked Mountain Waves
Hail	Widespread Sandstorm
Widespread Duststorm	Volcanic Ash

Table 5.6. Aerial Refueling (AR) Code.

Use of Track		Visibility	
Word	Code	NM	Code
Good	G	3	3
Fair	F	1-3	2
Poor	P	0-1	1
Unusable	U	-	0

NOTE:
The indicator AR plus one letter and one number must be used, such as: ARF2 ARU0.

Chapter 6

NATO CODES

6.1. Origin of Codes. The codes included in this part were developed specifically for use by NATO member countries during NATO exercises and operations. Units will use the codes when so directed by competent authority.

6.2. Maritime Aircraft Weather Code (MAWEC).

6.2.1. This is a standard NATO code intended primarily for meteorological reports from maritime patrol aircraft.

6.2.2. Mandatory Groups: MAWEC YYGGgg QcLaLaLaLa LoLoLoLoLo hahahaTT fcwm-VImBm ddfff

6.2.3. Optional Groups: 7Cehbhbhb

8Cehththt

9DFSDk

0imPoPoPo

6.2.4. Specification of Symbolic Letters :

MAWEC	Code Identifier
YY	Day of month with reference to UTC. First day of month is 01, the second 02, etc.
GGgg	Time of observation in hours and minutes UTC.
Qc	Quadrant of the globe (WMO Code 3333).
LaLaLaLa	Latitude in degrees and minutes.
LoLoLoLoLo	Longitude in degrees and minutes.
hahaha	True altitude of aircraft in hundreds of feet.
TT	Corrected air temperature in whole degrees C. Temperatures below 0 degrees C are coded by adding 50 to the numerical value, the hundreds figure, if any, being omitted.
fc	Flight conditions.
wm	Present weather.
V	Horizontal visibility (WMO Code 4300).
Im	Aircraft icing.
Bm	Turbulence.
dd	True direction of wind in tens of degrees at altitude hahaha.
fff	Wind speed in knots at the altitude hahaha.
7	Group indicator.
Ce	Character of cloud.

hbhbhb	Altitude of base of cloud in hundreds of feet.
8	Group indicator.
hththt	Altitude on top of clouds in hundreds of feet.
9	Group Indicator.
D	Direction of surface wind (WMO Code 0700).
F	Force of the surface wind (Beaufort Scale).
S	State of the sea (WMO Code 3700).
Dk	Direction of the swell (WMO Code 0700).
0	Group Indicator.
im	Method by which sea level pressure PoPoPo is reported.
PoPoPo	Sea level pressure in millibars. Missing data will be indicated by solidus lines (/).

6.2.5. Specifications:

fc - Flight Conditions

Code Figure	**Explanation**
0	sky clear
1	below cloud
2	on top
3	between layers
4	in and out of cloud
5	in cloud

Code Figure	**Explanation**
wm	Present Weather
0	below haze layer
1	above haze layer
2	showers
3	drizzle
4	fog at surface
5	freezing rain
6	rain
7	snow
8	hail

Code

Figure	**Explanation**
9	thunderstorm
X	no significant weather

Code

Figure	**Explanation**
Im	Aircraft Icing and
Bm	Turbulence
0	nil
1	light
2	moderate
3	severe

The groups 7Cehbhbhb and 8Cehththt refer to clouds reported under fc. These groups may be repeated to report more than one cloud layer. When hbhbhb or hththt cannot be determined, the form 7Ce///, 8Ce/// will be used.

Ce	Character of Cloud

Code

Figure	**Explanation**
7/8	Group Indicators
1	Mainly stratiform: scattered
2	Mainly stratiform: broken
3	Mainly stratiform: continuous
4	Mainly cumuliform: scattered
5	Mainly cumuliform: broken
6	Mainly cumuliform: continuous
7	Towering CU and CB: scattered
8	Towering CU and CB: broken
9	Towering CU and CB: continuous

Scattered applies when the clear intervals predominate. Broken applies when the cloud masses predominate.

Group Indicator

When the direction and strength of the surface wind cannot be reasonably estimated, D is coded as 9, F as a solidus (/).

Force of surface wind (Beaufort Scale)

Code Figure	**Explanation**
0	calm
1	1 to 3 knots
2	4 to 6 knots
3	7 to10 knots
4	11 to 16 knots
5	17 to 21 knots
6	22 to 27 knots
7	28 to 33 knots
8	34 to 40 knots
9	41 knots or over
0	Group Indicator
PoPoPo	sea level pressure should normally only be reported if the aircraft is flying at an altitude of 1500 feet or below.
im	Method by which sea level presure PoPoPo is reported
0-	PoPoPo is reported in whole hectopascals (omitting 1,000 figure if pressure is 1,000 hPa or above).
5-	PoPoPo is reported in inches (omitting tens figure and decimal point, e.g., 29.86 coded as 986).

6.3. Code for Mobile Meteorological Observing Units (MOBOB).

6.3.1. This is a standard NATO Code for surface and upper air meteorological reports by mobile meteorological observing units.

6.3.2. Form of Code: MOBOBQ imimHHH LaLaLaLoLoLo or XBXBXB XLXLXNXNXNXNXNXN

NOTE:

These groups replace the group IIiii or CCC in the corresponding WMO code form.

6.3.3. Specifications of Symbolic Letters:

MOBOB	Code identifier for the position of a mobile meteorological unit.
Q	Octant of the globe (0 = 0o - 90o West, 3 = 0o - 90o East).
imim	KAC cryptographic code set-reference identifier. // is used when encryption is not required.
HHH	Altitude above Mean Sea Level of reporting mobile station in deca-meters.
LaLaLa	Latitude in tenths of degrees. (Tenths are obtained by dividing the number of minutes by 6, disregarding the remainder.)
LoLoLo	Longitude in tenths of degrees. (See remarks under LaLaLa)
XBXBXB	Location in plain language or code.
XLXL	100,000 meter square identification.
XNXNXNXNXNXNXN	Numerical Grid coordinates given to the desired accuracy.

NOTE:

All latitude or longitude and location identifiers may be encrypted, as necessary.

6.4. Military Aircraft Voice Weather Code (MAVOC). This is a standard NATO Meteorological Code for voice transmissions of meteorological reports from aircraft. All items are reported in the recorded sequence, see table 6.1. Items 1 through 13 are mandatory. Items 14 through 18 are optional. Items which are unobservable, doubtful, or otherwise inapplicable are not recorded or transmitted, but dropped completely from the message. In addition to the basic data, only those words contained in column "VOICE" should be transmitted. For example, a report in Item 8 would be read "on top" and not "flight conditions - on top". Items are transmitted at each operational position report. Special reports should be rendered whenever moderate or severe icing or severe turbulence is encountered or whenever meteorological conditions are encountered which may affect the of the flight, or upon request.

6.5. Target Weather Reporting Code (TARWI). This is a standard NATO code designed primarily for target weather reports from strike aircrews.

6.5.1. Form of Code:

TARWI YQ

LaLaLa

LoLoLo

G'G'

C

H

V

W

R

XBXBXB

XLXLXNXNXNXN YYGGgg CHVWR

6.5.2. Specification of Symbolic Letters:

TARWI	Code Identifier
Y	Day of week (as given in WMO Code 4900)
Q	Octant of globe (as given in WMO Code 3300)
LaLaLa	Latitude in tenths of degrees
LoLoLo	Longitude in tenths of degrees
G'G'	Time of observation to the nearest quarter hour UTC (24 hr clock). G'G' gives time to nearest quarter hour. Time 15 minutes past hour - add 25 to hour for GGTime30 minutes past hour - add 50 to hour for GG Time 45 minutes past hour - add 75 to hour for GG
XBXBXB	Identification of Grid Zone Designation UTM
XLXL	100,000-meter square identification UTM
XNXNXNXN	Numerical grid coordinates UTM of the observation point given to the desired accuracy
YY	Day of month
GGgg	Time of observation in hours and minutes UTC
C	Low cloud amounts in eighths. Coded 9 if not observed
H	Low cloud height
V	Visibility
W	Weather
R	Remarks

6.5.3. Specifications:

H - Low cloud height

Table 6.1. Military Aircraft Voice Weather Code.

	RECORD	VOICE			ITEMS	RECORDED EXAMPLE	VOICE EXAMPLE
1	Station Called (and Relay Required, if necessary)	------		1	Addressee		
2	(Identification)	------		2	Aircraft Identification	NATO FLT 260	NATO Flight Two Six Zero

	RECORD	**VOICE**			**ITEMS**	**RECORD-ED EXAM-PLE**	**VOICE EXAMPLE**
3	MAVOC	MAVOC		3	Code Identification	MAVOC	MAVOC
4	(Latitude/Longitude) (Degrees and Minutes) (Place) ABM (Place) DR	Position. . . . . . Over . . . . . . ABeam . . . . . . Dead Reckoning		4	Position	3825N 1830W	Position Three Eight Two Five North One Eight Three Zero West
5	(Time) (In Hours and Minutes)	At		5	Time	2215	At Two Two One Five
6	FL (Number) ALT (Hundreds of Feet) ASC (FL Number or ALT) DES (FL Number or ALT)	Flight Level. . . . . . Altitude. . . . . . Climbing To . . . . . . Descending To	M A N D	6	Flight Level or Altitude	ALT 110	Altitude One One Thousand
7	PS (Degrees Celsius) MS (Degrees Celsius)	Plus. . . . . . Minus	A T	7	Air Temperature	PS 4	Plus Four
8	SKC BLO OTP BTL IAO INC	Sky Clear Below Clouds On Top Between Layers In and Out of Clouds In Clouds	O R Y	8	Flight Conditions	BTL	Between Layers

	RECORD	VOICE			ITEMS	RECORD-ED EXAM-PLE	VOICE EXAMPLE
9	BLO HZ OTP HZ RA/SNSH DZ FG SFC FZRA RA SN GR TS	Below Haze Above Haze Rain/Snow Showers Drizzle Fog at Surface Freezing Rain Rain Snow Hail Thunderstorms	I T E M S	9	Present Weather	RA	Rain
10	Distance in Nautical Miles			10	Horizontal Visibility	3	Three
11	ICE LGT ICE MOD ICE SEV	Icing Light Icing Moderate Icing Severe		11	Icing		
12	TURB LGT TURB MOD TURB SEV	Turbulence Light Turbulence Moderate Turbulence Severe		12	Turbulence	TURB LGT	Turbulence Light
13	(Direction in Degrees True Speed in Knots) (Latitude/Longitude or Place or Time) PS (Knots) MS (Knots)	. . . . . At. . . . . Plus. . . . . Minus		13	Spot or Mean Wind and Position or Equivalent Tailwind	240/15 38N 20W	Two Four Zero at One Five Three Eight North Two Zero West

	RECORD	VOICE			ITEMS	RECORD-ED EXAM-PLE	VOICE EXAMPLE
14	SCT (Direction) SLD (Direction/ Distance) SCT LN (Orientation/Direction/ Distance) SLD LN (Orientation/Direction/ Distance) SCAT ALL Quads SLD All Quads	Scattered. .Thru. . . . . Solid. . At . . . . . (Scattered Line). . To. . (Solid Line). . . . . .At. . Scattered All Quads Solid All Quads		14	Character of Radar Echo Orientation Bearing and Distance	SCT LN NNW - SSE E 20	Scattered Line North Northwest to South Southeast East at Two Zero
15	PS or MS (Difference in Feet) or MSL Pressure (MB or IN)	Plus . . . Minus. . . . . or . . . MB (or IN)		15	D-Value or Altimeter Setting	3016	Three Zero One Six Inches
16	PSP or NPST or UNK	Persistent or Non-persistent or Unknown		16	Contrails		
17	SCT BKN CONS STF CUF TCU CB Base (Height FT) Top (Height FT)	Scattered Broken Continuous Stratiform Cumuliform Towering Cumulous Cumulonimbus Base Top	P T I O N A L	17	Cloud	SCT CUF 8020 CONS STF __ 12	Scattered Cumuliform Base Two Thousand Top Eight Thousand Continuous Stratiform Base One Two Thousand

	RECORD	VOICE			ITEMS	RECORD-ED EXAM-PLE	VOICE EXAMPLE
18	(Direction/ Speed) GLS RPL WVL SLT MOD RUF VRUF HI VHI PHL (Direction of Swell) (Sea Ice)	. .At Force . Glass Ripple Wavelets Slight Moderate Rough Very Rough High Very High Phenomenal . . . . Concentra-tion. . . . . . Edge of Ice . . . . Icebergs.	I T E M S	18	Surface Winds State of Sea Direction of Swell 8/10 Sea Ice Within 5 NM of Coast Con-cen-tration and Edge of Sea Ice . . .Icebergs	NW at Force 5 MOD NW	Northwest at Force Five Moderate Northwest Eight Tenths Within Five Miles of Coast

Special Instructions

Item 1 Addressee - record station called, and when necessary, relay required.

Item 2 Aircraft identification - record radio call sign for aircraft.

Item 3 Code identification - record “MAVOC” at each position report.

Item 4 Position - record position in latitude and longitude in degrees and minutes, or over/abeam (ABM) a reporting point identified by name, or in relation to a significant geographical feature. When the position is established by dead reckoning, add “DR” to the position recorded.

Item 5 Time - in hours UTC and minutes

Item 6 Flight Level (FL) or Altitude (ALT) - record flight level in hundreds of feet when on standard pressure altimeter settings. Record altitude in hundreds of feet when on QNH. Record “climbing to (ASC)” or descending to (DES)” when climbing or descending to a new level after passing the reporting point.

Item 7 Air temperature (PS or MS) - record temperature in whole degrees Celsius, corrected for instrument error and airspeed.

Item 8 Flight conditions - describe general flight conditions, recording as “sky clear” (SKC) (meaning no cloud at any level) or “below clouds (BLO)” or “on top (OTP) or “between layers (BTL) or “in and out of clouds” (INC) (meaning continuously in clouds), as appropriate.

Item 9 Present weather - describe all weather elements encountered within the last 10 minutes if one or more of the following:

Below haze layer	(BLO HZ)
Above haze layer	(OTP HZ)
showers (rain/snow)	(RA/SNSH)
Drizzle	(DZ)
Fog at surface	(FGSFC)
Rain	(RA)
Snow	(SN)
Hail	(GR)
Thunderstorm	(TS)
Freezing Rain	(FZRA)

NOTE: When none of the above is encountered, omit present weather.

Item 10 Horizontal visibility. Record visibility in nautical miles. If below 1 mile, report fractions of a mile; if above 1 mile, report in whole nautical miles.

Item 11 Aircraft icing (ICE) - record aircraft icing encountered in last 10 minutes as light, moderate or severe.

Item 12 Turbulence (Turb) - record turbulence encountered in last 10 minutes as light, moderate or severe.

Item 13 Spot wind or mean wind and position thereof, or equivalent tailwind; record

Item 13.1. spot wind (direction in degrees true and speed in knots) and position (latitude and longitude to nearest whole degree, place or time) at which it was determined.

Item 13.2. mean wind between fixed when sufficiently reliable for operational use, and the position of the midpoint of the sector over which it was calculated.

Item 13.3. if unable to determine a reliable spot or mean wind, the equivalent tailwind between fixed reporting points as gain (PS or MS) of ground speed in knots.

Item 14 Radar data.

Item 14.1. Reported character or radar echo: Character of Radar Echo

Isolated uniform echo

Isolated irregular echo

Area more than half covered with echoes

Area about half covered with echoes

Area less than half covered with echoes

Area with scattered echoes

Line-shaped echo

Echoes arranged along a line

Parallel line-shaped echoes

Doubtful echo(es) of uncertain meteorological origin

Item 14.2. Report orientation of line by compass points of end of the line:

NNE - SSW

NE - SW

ENE - WSW

E - W

ESE - WNW

SE - NW

SSE - NNW

S - N

Item 14.3. Reporting bearing of radar echo center to 8 points of the compass (WMO Code 0700) NE, E, SE, S, SW, W, NW, N

Item 14.4 Report distance of radar echo center in nautical miles.

Item 15 D-values and altimeter setting D-values: Subtract readings of pressure altimeter setting to 29.92 IN HG or 1013.2 hPa (corrected for calibration and position error) from radio altimeter reading. Record difference (PS or MS) in feet. Omit when aircraft is between15 degrees N and 15 degrees S or over land. Altimeter settings: Report altimeter settings in inches or hectopascals (corrected for instrument error) determined when aircraft is flying close to sea level.

Item 16 Contrails. Report contrails observed as persistent, non-persistent or unknown.

Item 17 Cloud. Describe first as: scattered or broken or continuous. Then, as stratiform, cumuliform, towering cumulus, or cumulonimbus. Give altitudes of bases and or tops in feet MSL(to the nearest hundred when estimate is believed sufficiently accurate). Identify the altitude given by "base" or "top." Request for additional cloud layers.

Item 18 Surface conditions - report direction of surface wind to 8 points of the compass (as WMO Code 0700). report speed of surface wind in Beaufort Force. If calm report "calm" instead of direction and speed. If surface wind unobservable, omit. Report sea state as (WMO Code 3700): State of Sea Height in Meters

(Descriptive terms)	
(GLS) Calm (glassy)	0
(RPL) Calm (rippled)	0.01
(WVL) Smooth (wavelets)	0.1 - 0.5
(SLT) Slight	0.5 - 1.25
(MOD) Moderate	1.25 - 2.5

(RUF) Rough	2.5 - 4
(VRUF) Very Rough	4 - 6
(HI) High	6 - 9
(VHI) Very High	9 - l4
(PNL) Phenomenal	Over l4

Notes:

1. The average wave height as obtained from the larger well formed waves of the wave system being observed.

2. Report direction of swell to 8 points of the compass: NE, E, SE, S, SW, W, NW, N, or as "calm" or "confused".

3. Report, in plain language, position and extent of any sea ice or icebergs observed.

Code

Figure	**Explanation**
0	No low cloud
1	500 feet or less
2	1,000 feet
3	1,500 feet
4	2,000 feet
5	2,500 feet
6	3,000 feet
7	3,500 feet
8	4,000 feet
9	Not observed

Code

Figure	**Kilometers**	**Nautical Miles**
V	Visibility	
0	0 to less than 1	0 to less than 1/2
1	1 to less than 2	1/2 to less than 1
2	2 to less than 3	1 to less than 1 1/2
3	3 to less than 4	1 1/2 to less than 2
4	4 to less than 5	2 to less than 3
5	5 to less than 6	3
6	6 to less than 7	More than 3 to less than 4

Code Figure	Kilometers	Nautical Miles
7	7 to less than 8	4 to less than 5
8	8 or greater	5 or greater
9	V is not reported	V is not reported

W Weather

Code Figure	Explanation
0	not observed
1	no significant weather
2	sleet
3	dust or smoke
4	fog or haze
5	drizzle
6	rain
7	snow
8	showers
9	thunderstorms

Code Figure	Explanation
R	remarks
A	encoded weather is simulated (for exercise use)
B	multiply cloud hights by 10
C	no medium or scattered medium clouds
D	scattered variable broken medium clouds
E	broken variable overcast medium clouds
F	contrails at flight level
G	enroute weather predominantly IFR
H	enroute weather predominately VFR
I	gusty winds at surface
J	fog in valley
K	higher terrain obscured
L	surface conditions variable due to showers
M	thunderstorms occurring
N	thunderstorms en route
O	icing at flight level or freezing precipitation
P	surface wind NE quadrant
Q	surface wind SE quadrant
R	surface wind SW quadrant
S	surface wind NW quadrant
T	weather better to north
U	weather better to east
V	weather better to south
W	weather better to west
X	weather suitable for mission
Y	Weather marginal for mission
Z	weather unsuitable for mission

The remarks entry selected will be the one considered most significant for the mission.

JOHN P JUMPER, Lt General, USAF
DCS/Plans and Operations

Attachment 1

GLOSSARY OF REFERENCES, ABBREVIATIONS, ACRONYMS, AND TERMS

References

DoD Flight Information Publications (FLIPS)

Air Force Manual (AFM) 1-1, volumes 1 and 2, *Basic Aerospace Doctrine of the United States*

AFDD 45, *Aerospace Weather Operations*

AFPD 15-1, *Atmospheric and Space Environmental Support*

AFMAN 15-111, *Surface Weather Observations*

AFVA 15-117, *Synoptic Code Plotting Guide*

AFI 37-138, *Records Disposition--Procedures and Responsibilities*

Federal Meteorological Handbook No. 1 (FMH-1), *Surface Weather Observations and Reports*

FAAH 7340.1, *Federal Aviation Administration Handbook, Contractions*

FAAH 7350.6, *Federal Aviation Administration Handbook, Location Identifiers*

National Weather Service (NWS), *Operations Manual, Chapter 31*

NAVMETOCCOMINST 3143.1F, *Terminal Aerodrome Forecast (TAF) Code*

Abbreviations and Acronyms

—Light Intensity

+—Heavy Intensity

/—Virgule. Separator between PIREP cloud layers, layers of turbulence, or layers of icing.

ABV—Above

AC—Altocumulus Cloud(s)

ACC—Altocumulus Castellanus Cloud(s)

ACFT MSHP—Aircraft Mishap

ACSL—Standing Lenticular Altocumulus Castellanus Cloud(s)

ADWS—Automatic Digital Weather Switch

AFW—Air Force Weather

AIREP—Air Report

ALP—Airport Location Point

ALSTG—Altimeter Setting

APRNT—Apparent

APRX—Approximate, Approximately

ASOS—Automated Observing Observation Site

ATC—Air Traffic Control

AUTO—Automated Report

AWDS—Automated Weather Distribution System

BC—Patches (Descriptor used with FG)

BKN—Broken (used to describe cloud cover or weather phenomena)

BL—Blowing (descriptor used with DU, SA or SN)

BLO—Below

BR—Mist

BWS—Base Weather Station

CA—Cloud to air (lightning)

CB—Cumulonimbus Cloud(s)

CBMAN—Cumulonimbus Mammatus Cloud(s)

CC—Cirrocumulus Cloud(s), or Cloud to cloud lightning

CCSL—Standing Lenticular Cirrocumulus Cloud(s)

CG—Cloud to ground (lightning)

CHOP—Turbulence type characterized by rapid, rhythmic jolts

CIG—Ceiling

CLR—Clear (icing)

CONS—Continuous

CONTRAILS—Ice vapor trails

CONUS—Continental United States

COR—Correction To A Previously Disseminated Report

CS—Cirrostratus Cloud(s)

DoD—Department Of Defense

DR—Low Drifting (descriptor used with DU, SA, or SN)

DS—Duststorm

DU—Widespread Dust

DZ—Drizzle

E—East

EMBD—Embedded (used to describe thunderstorms)

ENE—East Northeast

ENRT—Enroute

ESE—East Southeast

EST—Estimate, Estimated

EXTRM—Extreme (used to modify turbulence

FAA—Federal Aviation Administration

FAAH—Federal Aviation Administration Handbook

FC—Funnel Cloud

+FC—Tornado or Waterspout

FEW—Few (used to describe cloud cover or weather phenomena)

FG—Fog

FRQ—Frequent

FIBI—Filed But Impracticable To Transmit

FIRST—First TAF observation After A Break In Coverage At Manual Station

FLIP—Flight Information Publication

FMH-1—Federal Meteorological Handbook No.1, *Surface Weather Observations & Reports*

FT—Feet

FU—Smoke

FZ—Freezing (descriptor used with precipitation or fog)

G—Gust

GND—Ground

GEN—General Type Contraction

GR—Hail of 1/4 inch or more

GS—Small Hail and/or Snow Pellets (less than 1/4 inch)

HLSTO—hailstone(s)

hPa—Hectopascals (millibars)

HVY—Heavy (used in PIREP remarks to modify precipitation)

HZ—Haze

IC—Ice Crystals, In-Cloud Lightning

ICAO—International Civil Aviation Organization

INCRG—Increasing

INTER—Intermittent

ISOL—Isolated (used to describe weather phenomenon remarks of PIREP)

KT—Knots

L—Left (With Reference To Runway Designation)

LAST—Last Forecast Before A Break In Coverage At A Manual Station

LGT—Light(used to modify turbulence or icing)

LLWS—Low level wind shear

LN—Line (used to describe thunderstorm formations in remarks of a PIREP)

LST—Local Standard Time

LTG—Lightning

LTGCA—Lightning Cloud to Air

LTGCC—Lightning Cloud to Cloud

LTGCGA—Lightning Cloud to Ground

LTGIC—Lightning in Cloud

LWDS—Local Weather Dissemination System

LWR—Lower

LYR—Layer (of clouds)

M—Sub-zero temperature

MACOM—Major Army Command

MAJCOM—Major Command

METAR—Aviation Routine Weather Report

MI—Shallow

MOD—Moderate

MOV—Moved/Moving/Movement

MSL—Mean Sea Level

MT—Mountains

MX—Mixed - A type of icing characterized as a combination of clear and rime ice

N—North

N/A—Not Applicable

NAVAID—Navigational aids (JPI-02)

NE—Northeast

NIL—Transmitted When Report Not Ready On Time

NMRS—Numerous (used to describe weather phenomena in remarks of a PIREP)

NW—Northwest

NWS—National Weather Service

OCNL—Occasional

OVC—Overcast

OHD—Overhead

P—Greater Than

PCPN—Precipitation (used in PIREPs)

PE—Ice Pellets

PIREP—Pilot Weather Report.

PO—Dust/Sand Whirls (Dust Devils)

PR—Partial (descriptor used with FG)

PV—Prevailing Visibility

PY—Spray

R—Right (With Reference To Runway Designation)

RA—Rain

RMK—Remark

RVR—Runway Visual Range

RVRNO—RVR System Not Available

RWY—Runway

S—South

SA—Sand

SCSL—Standing Lenticular Stratocumulus Cloud(s)

SCT—Scattered

SE—Southeast

SEV—Severe (intensity modifier used with turbulence and icing in PIREPs)

SFC—Surface

SG—Snow Grains

SH—Shower(s) (descriptor used with RA, SN, PE, GS, or GR)

SKC—Sky Clear

SLD—Solid (used to describe weather phenomena in remarks of PIREPs)

SM—Statute Miles

SN—Snow

SP—Snow Pellets

SQ—Squall

SS—Sandstorm

STN—Station

SW—Southwest

TACAN—UHF (Ultra High Frequency - 300 to 3000 MHz) Tactical Air Navigation Aid

TCU—Towering Cumulus

TEI—Text Element Indicator

TOC—Top of Climb (used in PIREPs)

TOP—Top of Clouds (used in PIREPs)

TS—Thunderstorm

TWR—Tower

UA—TEI used in routine PIREP

UNKN—Unknown PIREP TEI

UP—Unknown Precipitation

US—United States

UTC—Coordinated Universal Time

UTO—Universal Time Observed

UUA—TEI used in urgent PIREP

V—Variable

VA—Volcanic Ash

VC—Vicinity (proximity qualifier)

VHS—Very high Frequency (30 to 30 MHz)

VIS—Visibility

VISNO—Visibility At Secondary Location Not Available

VOR—Very high frequency omnidirectional range station (JPI-02)

VORTAC—Very high frequency omnidirectional range station/tactical air navigation (JPI-02)

VRB—Variable

VV—Vertical Visibility

W—West

WMO—World Meteorological Organization

WND—Wind

WSHFT—Wind Shift

Z—Zulu (JPI-02)

Terms

Actual Lead Time—The elapsed time between issue time of an advisory or warning and the first occurrence of the event.

Air Force Meteorological Data System—Provides weather alphanumeric products to DoD units worldwide, including the CONUS (COMEDS), Europe (EURMEDS), Pacific (PACMEDS), Alaska (ALMEDS), and the Atlantic (ALTMEDS) which covers the North Atlantic and Caribbean areas.

At the Station—Used to forecast weather phenomena when within 5 statute miles (<8000 meters) of the point(s) of observation.

Automated Weather Distribution System—An integrated automated system designed to provide weather and air traffic control products to support the missions of base weather stations, weather support units, air traffic control agencies, and command posts of the DoD.

Automated Weather Network—A global communications network used for collecting and distributing alphanumeric environmental/weather data and Notices to Airmen (NOTAMs). It consists of: two overseas Automatic Digital Weather Switches (ADWSs) which are linked to AFGWC via high-speed communications circuits through a hub ADWS at Tinker AFB OK and the CFEP at Offutt AFB NE; three overseas Weather Intercept Concentrator Units, and their supporting circuits; and the circuitry and interfaces interconnecting the ADWSs with other DoD, federal, and foreign meteorological and aviation facilities.

Aviation Routine Weather Report—The WMO code format used worldwide (except US and Canada until 1996) to code weather observations.

Bulletin Heading—A combination of letters and numbers that describe the contents of a bulletin, including the data type, geographical location, ICAO identifier of the originator and a date-time group.

Contrails—(Condensation trail) - a visible cloud streak, usually brilliant white in color, which trails behind a missle or other vehicle in flight under certail conditions. (JPI-02)

Distant from the station—Used to forecast weather phenomena expected beyond 10 statute miles (>16 kilometers.)

File Time—The time a weather message or bulletin is scheduled to be transmitted. Expressed either as a specific time or a specific time block during which the message will be transmitted.

ICAO Identifier—A specifically authorized 4-letter identifier assigned to a location and documented in ICAO Document 7910.ICAO (used by AWDS): An ICAO identifier with a fifth character appended which designates a specific AWDS functional area (reference AWDS Positional Handbooks).

International Civil Aviation Organization—A United Nations organization specializing in matters dealing with international aviation and navigation.

Issue Time—Time the last agency was notified. Exclude follow-up notifications when determining issue time.

Limited Duty Station—A weather station that provides less than 24-hour a day forecast service.

Meteorological Watch—The process of monitoring the occurrence or possible development of weather phenomena that may endanger life, property, pose a safety hazard, or impact a customer's mission.

NAVAID—. An electronic navigation aid facility, specifically limited to VHF Omni-Directional Radio Range (VOR), or combined VHF Omni-Directional Radio Range/Tactical Air Navigation (VORTAC) facilities.

Pilot Report—A report of in-flight weather provided by an aircraft crew member.

Scheduled—The time that a weather report or bulletin is due to be transmitted. The scheduled transmission time may be expressed as a specific time or a specific block of time during which the data must be transmitted.

Severe Thunderstorm—The simultaneous occurrence of a thunderstorm (descriptor TS), in conjunction with hail (GR) greater than or equal to 3/4" diameter and/or surface wind greater than or equal to 50 knots.

Severe Weather—Any weather condition that poses a hazard to property or life.

Squall.—A strong wind characterized by a sudden onset in which the wind speed increases at least 16 knots and is sustained t 22 knots or more for at least one minute.

Text Element Indicator (TEI)—A two-letter contraction with solidus used in the standard PIREP message to identify the elements being reported.

Vicinity—Used to report present weather phenomena when between 5 (8000 meters) and 10 statute miles (16 kilometers) of the station.

Weather Advisory—A special notice of observed or forecast weather conditions to alert supported agencies of weather phenomena that may impact its operation is occurring or is expected to occur.

Weather Watch—A special notice of forecast weather phenomena that alerts supported agencies to the potential for mission impacting weather conditions.

Attachment 2

WMO CODE FORMS

Reference List of WMO Code Forms

FM 12-IX Ext.	SYNOP	Report of synoptic surface observations from a land station.
FM 13-IX Ext.	SHIP	Report of synoptic surface observation from a sea station.
FM 15-IX Ext.	METAR	Aviation routine weather report (with or without trend-type landing forecast).
FM 16-IX Ext.	SPECI	Aviation selected special weather report.
FM 18-IX Ext	DRIFTER	Report of a drifting-buoy observation.
FM 20-VIII	RADOB	Report of ground radar weather observation.
FM 22-IX Ext.	RADREP	Radiological data report (monitored on a routine basis or in case of accident)
FM 32-IX	PILOT	Upper-wind report from a land station.
FM 33-IX	PILOT SHIP	Upper-wind report from a sea station.
FM 34-IX	PILOT MOBIL	Upper-wind report from a mobile land station.
FM 35-IX Ext.	TEMP	Upper-level pressure, temperature, humidity, and wind report from a land station.
FM 36-IX Ext.	TEMP SHIP	Upper-level pressure, temperature, humidity, and wind report from a sea station.
FM 37-IX Ext.	TEMP DROP	Upper level pressure, temperature, humidity, and wind report from a sonde released by carrier balloons or aircraft.
FM 38-IX Ext.	TEMP MOBIL	Upper-level pressure, temperature, humidity, and wind report from a mobile land station.
FM 39-VI	ROCOB	Upper level temperature, wind, and air density report from a land rocketsonde station.
FM 40-VI	ROCOB SHIP	Upper level temperature, wind, and air density report from a rocketsonde station on a ship.
FM 41-IV	CODAR	Upper air report from an aircraft (other than weather reconnaissance aircraft).
FM 42-IX	AMDAR	Aircraft report (aircraft meteorological data relay).
FM 44-V	ICEAN	Ice analysis.
FM 45-IV	IAC	Analysis in full form.
FM 46-IV	IAC FLEET	Analysis in abbreviated form.
FM 47-IX Ext.	GRID	Processed data in the form of grid point values.

FM 49-IX Ext.	GRAF	Processed data in the form of grid point values. (abbreviated code form).
FM 50-VIII Ext.	WINTEM	Forecast upper wind and temperature for aviation.
FM 51-IX Ext	TAF	Aerodrome Forecast.
FM 53-IX Ext.	ARFOR	Area forecast for aviation.
FM 54-IX Ext	ROFOR	Route forecast for aviation.
FM 57-IX Ext.	RADOF	Radiological trajectory dose forecast (defined time of arrival and location).
FM 61-IV	MAFOR	Forecast for shipping.
FM 62-VIII Ext.	TRACKOB	Report of marine surface observation along a ship's track.
FM 63-IX	BATHY	Report of bathythermal observation.
FM 64-IX	TESAC	Temperature, salinity and current report from a sea station.
FM 65-IX	WAVEOB	Report of spectral wave information from a sea station or from a remote platform (aircraft or satellite).
FM 67-VI	HYDRA	Report of hydrological observation from a hydrological station.
FM 68-VI	HYFOR	Hydrological forecast.
FM 71-VI	CLIMAT	Report of monthly means and totals from a land station.
FM 72-VI	CLIMAT SHIP	Report of monthly means and totals from an ocean weather station.
FM 73-VI	NACLI	
	CLINP	
	SPCLI	Report of monthly means for an oceanic area.
	CLISA	
	INCLI	
FM 75-VI	CLIMAT TEMP	Report of monthly aerological means from a land station.
FM 76-VI	CLIMAT TEMP SHIP	Report of monthly aerological means from an ocean weather station.
FM 81-I	SFAZI	Synoptic report of bearings of sources of atmosphere.
FM 82-I	SFLOC	Synoptic report of the geographical location of sources of atmosphere.
FM 83-I	SFAZU	Detailed report of the distribution of sources of atmosphere by bearings for any period up to and including 24 hours.
FM 85-IX	SAREP	Report of synoptic interpretation of cloud data obtained by a meteorological satellite.

FM 86-VIII Ext.	SATEM	Report of satellite remote upper air soundings of pressure, temperature, and humidity.
FM 87-VIII Ext.	SARAD	Report of satellite clear radiance observations.
FM 88-VI	SATOB	Report of satellite observations of wind, surface temperature, cloud, humidity, and radiation.
FM 92-VIII Ext.	GRIB	Processed data in the form of grid-point (gridded binary) values expressed in binary form.
FM 94-IX	BUFR	Binary universal form for the representation of meteorological data.

Attachment 3

WMO CODE TABLES

Listed in this attachment are a few of the WMO Code Tables; i.e., those that weather units may require.

0104

Ac Accuracy in Determining the Position of the Center or Eye of the Tropical Cyclone

Code Figure	
1	Eye visible on radar scope, accuracy good (within 10km)
2	Eye visible on radar scope, accuracy fair (within 30km)
3	Eye visible on radar scope, accuracy poor (within 50km)
4	Position of the center within the area covered by the radar scope, determination by means of the spiral-band overlay, accuracy good (within 10km)
5	Position of the center within the area covered by the radar scope, determination by means of the spiral-band overlay, accuracy fair (within 30km)
6	Position of the center within the area covered by the radar scope, determination by means of the spiral-band overlay, accuracy poor (within 50km)
7	Position of the center outside the area covered by the radar scope extrapolation by means of the spiral-band overlay
/	Accuracy undetermined.

0204

ac Change in Character of the Eye During the 30 Minutes Preceding the Time of Observation.

Code Figure	
0	Eye has first become visible during the past 30 minutes
1	No significant change in the characteristics or size of the eye
2	Eye has become smaller with no other significant change in characteristics
3	Eye has become larger with no other significant change in characteristics
4	Eye has become less distinct with no significant change in size
5	Eye has become less distinct and decreased in size
6	Eye has become less distinct and increased in size
7	Eye has become more distinct with no significant change in size
8	Eye has become more distinct and decreased in size

9	Eye has become more distinct and increased in size
/	Change in character and size of eye cannot be determined

0235

ae Tendency of Echo Pattern

Code Figure	**Tendency of Intensity**	Tendency of the Area
1	Decreasing	Decreasing
2	Decreasing	No appreciable change
3	Decreasing	Increasing
4	No appreciable change	Decreasing
5	No appreciable change	No appreciable change
6	No appreciable change	Increasing
7	Increasing	Decreasing
8	Increasing	No appreciable change
9	Increasing	Increasing
/	Undetermined	Undetermined

0300

B Turbulence

Code Figure	
0	None
1	Light turbulence
2	Moderate turbulence in clear air, occasional
3	Moderate turbulence in clear air, frequent
4	Moderate turbulence in cloud, occasional
5	Moderate turbulence in cloud, frequent
6	Severe turbulence in clear air, occasional
7	Severe turbulence in clear air, frequent
8	Severe turbulence in cloud, occasional
9	Severe turbulence in cloud, frequent

0700

Direction Or Bearing In One Figure

D	True Direction From Which Surface Wind is Blowing
	True Direction toward which ice has drifted in the past 12 hours
DH	True Direction from which CH clouds are moving
DK	True Direction from which swell is moving
DL	True Direction from which CL clouds are moving
DM	True Direction from which CM clouds are moving
Da	True Direction in which orographic clouds or clouds with vertical development are seen
	True Direction in which the phenomenon indicated is observed or in which conditions specified in the same group are reported
De	True Direction towards which an echo pattern is moving
Dp	True Direction from which the phenomenon indicated is coming
Ds	True Direction of resultant displacement of the ship during the three hours preceding the time of observation
D1	True Direction of the point position from the station

Code
Figure

0	Calm (in D, DK), or stationary (in DS), or at the station (in Da and D1 or stationary or no clouds (in DH, DL, DM)
1	NE
2	E
3	SE
4	S
5	SW
6	W
7	NW
8	N
9	All directions (in Da, D1), or confused (in DK), or variable (in Dwind), or unknown (in Ds), or unknown or clouds invisible (in DH, DL, DM)
/	Report from a coastal land station or displacement of ship not reported (in Ds only)

0877

Direction in Two Figures

dd	True direction, in tens of degrees, from which wind is blowing (or will blow)
	Forecast true direction, in tens of degrees, from which wind will blow at the relevant grid point
	True direction, in tens of degrees, from which wind is blowing, derived from the direction from movement of cloud elements
dhdh	True direction, in tens of degrees, from which wind will blow at the height indicated by hxhxhx
djdj	True direction, in tens of degrees, from which the jet-stream wind is blowing (or will blow)
dmdm	True direction, in tens of degrees, from which maximum wind will blow at flight level given by nmnmnm
	True direction, in tens of degrees, from which the maximum wind will blow at the height given by h'mh'm
dsds	True Direction, in tens of degrees, toward which system or front is moving
	True Direction, in tens of degrees, toward which the tropical cyclone or system is moving.
dwdw	True direction, in tens of degrees, from which waves are coming
dw1dw1	True direction, in tens of degrees, from which swell waves are coming
dw2dw2	True direction, in tens of degrees, from which swell waves are coming
d0d0	True direction, in tens of degrees, towards which sea-surface current is moving
d0d0	True direction, in tens of degrees, towards which sea current at selected and/or significant depths starting with the sea surface is moving
d1d1	True direction, in tens of degrees, towards which sea current at selected and/or significant depths starting with the sea surface is moving
dndn	True direction, in tens of degrees, towards which sea current at selected and/or significant depths starting with the sea surface is moving
d1d1	True direction, in tens of degrees, from which wind is blowing at specified levels
d2d2	True direction, in tens of degrees, from which wind is blowing at specified levels
dndn	True direction, in tens of degrees, from which wind is blowing at specified levels

Code Figure		**Code Figure**	
00	Calm (No motion dsds or no waves)	01	5 deg. - 14 deg.
02	15 deg. - 24 deg.	03	25 deg. - 34 deg.
04	35 deg. - 44 deg.	05	45 deg. - 54 deg.
06	55 deg. - 64 deg.	07	65 deg. - 74 deg.
08	75 deg. - 84 deg.	09	85 deg. - 94 deg.
10	95 deg. -104 deg.	11	105 deg. -114 deg.

12	115 deg. -124 deg.	13	125 deg. -134 deg.
14	135 deg. -144 deg.	15	145 deg. -154 deg.
16	155 deg. -164 deg.	17	165 deg. -174 deg.
18	175 deg. -184 deg.	19	185 deg. -194 deg.
20	195 deg. -204 deg.	21	205 deg. -214 deg.
22	215 deg. -224 deg.	23	225 deg. -234 deg.
24	235 deg. -244 deg.	25	245 deg. -254 deg.
26	255 deg. -264 deg.	27	265 deg. -274 deg.
28	275 deg. -284 deg.	29	285 deg. -294 deg.
30	295 deg. -304 deg.	31	305 deg. -314 deg.
32	315 deg. -324 deg.	33	325 deg. -334 deg.
34	335 deg. -344 deg.	35	345 deg. -354 deg.
36	355 deg. -004 deg.	99	Variable, or all directions, or unknown (for dsds), or waves confused, direction indeterminate

1535

He Height of Echo Top

Code Figure	
0	0 to less than 2km
1	2 to less than 4km
2	4 to less than 6km
3	6 to less than 8km
4	8 to less than 10km
5	10 to less than 12km
6	12 to less than 14km
7	14 to less than 16km
8	16 to less than 18km
9	18km and above
/	Undetermined

1677

hshs Height of base of cloud layer or mass whose genus is indicated by C

htht Height of the tops of the lowest clouds or height of the lowest cloud layer or fog

Code Figure	Meters	Code Figure	Meters
00	<30	01	30
02	60	03	90
04	120	05	150
06	180	07	210
08	240	09	270
10	300	11	330
12	360	13	390
14	420	15	450
16	480	17	510
18	540	19	570
20	600	21	630
22	660	23	690
24	720	25	750
26	780	27	810
28	840	29	870
30	900	31	930
32	960	33	990
34	1020	35	1050
36	1080	37	1110
38	1140	39	1170
40	1200	41	1230
42	1260	43	1290
44	1320	45	1350
46	1380	47	1410
48	1440	49	1470
50	1500	51-55	Not used
56	1800	57	2100
58	2400	59	2700
60	3000	61	3300
62	3600	63	3900
64	4200	65	4500
66	4800	67	5100
68	5400	69	5700
70	6000	71	6300
72	6600	73	6900

74	7200	75	7500
76	7800	77	8100
78	8400	79	8700
80	9000	81	10,500
82	12,000	83	13,500
84	15,000	85	16,500
86	18,000	87	19,500
88	21,000	89	>21,000
90	Less than 50m	91	50 to 100m
92	100 to 200m	93	200 to 300m
94	300 to 600m	95	600 to 1000m
96	1000 to 1500m	97	1500 to 2000m
98	2000 to 2500m	99	2500m or more, or no clouds

Note: If the observed value is between two of the heights as given in the table, the code figure for the lower height will be reported, except for code figure 90-99; in this decile, a value exactly equal to one of the heights at the ends of the ranges will be coded in the higher range; e.g., a height of 600m is reported by code figure 95.

1690

hBhBhB	Height of lowest level of turbulence
hfhfhf	Altitude of the 0o C isotherm
hihihi	Height of lowest level of icing
hshshs	Height of base of cloud layer or mass, or observed or forecast vertical visibility
hththt	Altitude of cloud layer or mass
hxhxhx	Altitude to which temperature and wind refer

Code		**Height**
Figure	**Meters**	**Feet**
000	<30	<100
001	30	100
002	60	200
003	90	300
004	120	00
005	150	500
006	180	600
007	210	700

008	240	800	
009	270	900	
010	300	1,000	
011	330	1,100	
etc.	etc.	etc.	
099	2,970	9,900	
100	3,000	10,000	
110	3,300	11,000	
120	3,600	12,000	
etc.	etc.	etc.	
990	29,700	99,000	
999		30,000 or more	100,000 or more

Notes:

1 The code is direct reading in units of 30 meters.

2 Consider the code table as a coding device in which certain code figures are assigned values. These are discrete values, not ranges. Make any observation or forecast of values coded in the code table without regard to the code table. The coding is then accomplished according to the following rule: If the observed or forecast value is between two of the heights given in the table, report the code figure for the lower height

1733

Ic Type of forecast ice accretion on the external parts of aircraft

Code Figure	
0	No icing
1	Light icing
2	Light icing in cloud
3	Light icing in precipitation
4	Moderate icing
5	Moderate icing in cloud
6	Moderate icing in precipitation
7	Severe icing
8	Severe icing in cloud
9	Severe icing in precipitation

1735

Ie	Intensity of Echoes

Code Figure	**Specifications**	**Reflectivity (mm6m-3)**
0	Very weak	0 to 2.30 x 10
1	Very Weak (estimated)	
2	Weak	2.31 x 10 to 9.40 x 102
3	Weak (estimated)	
4	Moderate	9.41 x 102 to 3.70 x 104
5	Moderate (estimated)	
6	Strong	3.71 x 104 to 5.00 x 105
7	Strong (estimated)	
8	Very strong	5.00 x 105
9	Very strong (estimated)	
/	Undetermined	

2700

N	Total Cloud Cover
Nh	Amount of all the CL cloud present, or, if no CL cloud is present, the amount of all the CM cloud(s) present
Ns	Amount of individual cloud layer or mass whose genus is indicated by C
N’	Amount of cloud whose base is below the level of the station

Code Figure		
0	0	0
1	1 okta or less, but not zero	1/10 or less, but not zero
2	2 okta	2/10 - 3/10
3	3 okta	4/10
4	4 okta	5/10
5	5 okta	6/10
6	6 okta	7/10 - 8/10
7	7 okta or more, but not 8 okta	9/10 or more but not 10/10
8	8 oktas	10/10
9	Sky obscured by fog and/or other meteorological phenomena	

/ Cloud cover is indiscernible for reasons other than fog or other meteorological phenomena, or observation is not made

3300

Q Octant of the Globe

Code Figure	**Greenwich Longitude**	Hemisphere
0	0 deg. - 90 deg. W	
1	90 deg. - 180 deg. W	North
2	180 deg. - 90 deg. E	
3	90 deg. - 0 deg E	
5	0 deg. - 90 deg. W	
6	90 deg. - 180 deg. W	South
7	180 deg. - 90 deg. E	
8	90 deg. - 0 deg. E	

3333

Qc Quadrant of the Globe

Code Figure	**Latitude**	Longitude
1	North	East
3	South	East
5	South	West
7	North	West

3555

Rw Wave Length of the Radar

Code Figure	
1	10 to less than 20mm
3	20 to less than 40mm

5	40 to less than 60mm
7	60 to less than 90mm
8	90 to less than 110mm
9	110mm and greater

3652

rt	Distance between the end of the observed outermost spiral band and the center of the tropical cyclone.

Code Figure	
0	0 to less than 100km
1	100 to less than 200km
2	200 to less than 300km
3	300 to less than 400km
4	400 to less than 500km
5	500 to less than 600km
6	600 to less than 800km
7	800km or more
/	Doubtful or undetermined

3700

S	State of Sea
S’	State of the water surface in an alighting area

Code Figure	**Descriptive Terms**	**Height* in Meters**
0	Calm (glassy)	0
1	Calm (rippled)	0-0.1
2	Smooth (wavelets)	0.1 - 0.5
3	Slight	0.5 - 1.25
4	Moderate	1.25 - 2.5
5	Rough	2.5 - 4
6	Very Rough	4 - 6
7	High	6 - 9
8	Very High	9 - 14

9	Phenomena	Over 14

Notes:

1 * These values refer to well-developed wind waves of the open sea. While priority will be given to the descriptive terms, these height values may be used for guidance by the observer when reporting the total state of agitation of the sea resulting from various factors such as wind, swell, currents, angle between swell and wind, etc.

2. The exact bounding height will be assigned for the lower code figure; e.g., a height of 4 m is coded as 5.

3704

SC Shape and Definition of the Eye of the Tropical Cyclone

Code Figure	
0	Circular
1	Elliptical - the minor axis at least 3/4 the length of the major axis
2	Elliptical - the minor axis at less than 3/4 the length of the major axis
3	Apparent double eye
4	Other shape
5	Ill defined
/	Undetermined

Code figures 0 through 4 are for well defined eyes.

4013

tL Thickness of Layer

Code Figure	**Feet**	Meters
0		Up to top of cloud
1	1000	300
2	2000	600
3	3000	900
4	4000	1200
5	5000	1500
6	6000	1800

7	7000	2100
8	8000	2400
9	9000	2700

4035

te	Time interval Over Which the Movement of the Center or the eye of the tropical cyclone or the system given by et has been calculated

Code Figure	
3	During the preceding 30 minutes
5	During the preceding 1 hour
6	During the preceding 2 hours
7	During the preceding 3 hours
8	During the preceding 6 hours
9	During a period more than 6 hours
/	Undetermined

4300

V	Horizontal Surface Visibility
Vs	Visibility seawards (from a coastal station)
V's	Visibility over the water surface of an alighting area

Code Figure	
0	Less than 50 meters
1	50 - 200 meters
2	200 - 500 meters
3	500 - 1000 meters
4	1 - 2 km
5	2 - 4 km
6	4 -10 km
7	10 -20 km
8	20 -50 km
9	50 km or more

4504

Wc	Diameter or length of major axis of the eye of the tropical cyclone
Code Figure	
0	Less than 5km
1	10 to less than 15km
3	15 to less than 20km
4	20 to less than 25km
5	25 to less than 30km
6	30 to less than 35km
7	35 to less than 40km
8	40 to less than 50km
9	50km or greater
/	Undetermined

4677

ww Present Weather

ww = 00 - 49 No precipitation at the station at the time of observation

ww = 00 - 19 No precipitation, fog, ice fog (except for 11 and 12),duststorm, sandstorm, drifting or blowing snow at the station * at the time of observation or, except for O9 and 17, during the preceding hour

No Meteors	00	Cloud development not observed	characteristic change
Except		or not observable	of the state of sky
Photometeors	01	Clouds generally dissolving or	during the past hour
		becoming less developed	
	02	State of sky on the whole unchanged	
	03	Clouds generally forming or developing	
	04	Smoke - Visibility reduced by smoke, e.g., veldt or forest fires, industrial smoke or volcanic ashes	

05	Haze
06	Widespread dust in suspension in the air, not raised by wind at or near the station at the time of observation
07	Dust or sand raised by wind at or near the station at the time of observation, but no well developed dust whirl(s) or sand whirl(s) and no duststorm or sandstorm seen; or, in the case of ships, blowing spray at the station.
08	Well-developed dust whirl(s) or sand whirl(s) seen at or near the station during the preceding hour or at the time of observation, but no duststorm or sandstorm
09	Duststorm or sandstorm within sight at the time of observation, or at the station during the preceding hour.
10	Mist
11	Patches of shallow fog or ice fog at the station,
12	More or less whether on land or sea, not deeper than continuous about 2 meters on land or 10 meters at sea
13	Lightning visible, no thunder heard
14	Precipitation within sight, not reaching the ground or the surface of the sea.
15	Precipitation within sight, reaching the ground or the surface of the sea, but distant, i.e., estimated to be more than 5km from the station.

	16	Precipitation within sight, reaching the ground or the surface of the sea, near to, but not at the station.	
	17	Thunderstorm, but no precipitation at time of observation	
	18	Squalls	At or within sight of the
	19	Funnel cloud(s)**	station during the preceding hour or at the time of observation.

* The expression "at the station" refers to a land station or a ship

** Tornado cloud or waterspout

ww = 20-29 Precipitation, fog, ice fog or thunderstorm at the station during the preceding hour but not at the time of observation

	20	Drizzle (not freezing) or snow grains	
	21	Rain (not freezing)	not falling
	22	Snow	as
	23	Rain and snow or ice pellets	shower(s)
	24	Freezing drizzle or freezing rain	
	25	Shower(s) of rain	
	26	Shower(s) of snow, or rain and snow	
	27	Shower(s) of hail*, or rain and hail*	
	28	Fog or ice fog	
	29	Thunderstorm (with or without precipitation)	

*Hail, small hail, snow pellets

ww = 30 - 39 Duststorm, sandstorm, drifting or blowing snow

	30		- has decreased during the preceding hour.
	31	Slight or moderate duststorm or sandstorm	- no appreciable change during preceding hour
	32		- has begun or has increased during the

		preceding hour
33		- has decreased during the preceding hour
34	Severe duststorm or sandstorm	- no appreciable change during preceding hour
35		- has begun or has increased during preceding hour
36	Slight or moderate drifting snow	
37	Heavy drifting snow	generally low (below eye level)
38	Slight or moderate blowing snow	
39	Heavy blowing snow	generally high (above eye level)

ww = 40 - 49 Fog or ice fog at the time of observation

40	Fog or ice fog at a distance at the time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer	
41		Fog or ice fog in patches
42	Fog or ice fog, sky visible	has become thinner during the
43	Fog or ice fog, sky invisible	preceding hour
4	Fog or ice fog, sky visible	no appreciable change during
45	Fog or ice fog, sky invisible	the preceding hour
46	Fog or ice fog, sky visible	has begun to become thicker during
47	Fog or ice fog, sky invisible	the preceding hour
48	Fog, depositing rime, sky visible	
49	Fog, depositing rime, sky invisible	

ww = 50 - 99 Precipitation at the station at the time of observation

ww = 50 - 59 Drizzle

	50	Drizzle, not freezing, intermittent	slight at time of observation
	51	Drizzle, not freezing, continuous	
	52	Drizzle, not freezing, intermittent	moderate at time of observation
	53	Drizzle, not freezing, continuous	
	54	Drizzle, not freezing, intermittent	heavy (dense) at time of
	55	Drizzle, not freezing, continuous	observation
	56	Drizzle, freezing, slight	
	57	Drizzle, freezing, moderate or heavy (dense)	
	58	Drizzle and rain, slight	
	59	Drizzle and rain, moderate or heavy	
ww = 60 - 69	Rain		
	60	Rain, not freezing, intermittent	slight at time of observation
	61	Rain, not freezing, continuous	
	62	Rain, not freezing, intermittent	moderate at time of observation
	63	Rain, not freezing, continuous	
	64	Rain, not freezing, intermittent	heavy at time of observation
	65	Rain, not freezing, continuous	

66	Rain, freezing, slight	
67	Rain, freezing, moderate or heavy	
68	Rain or drizzle and snow, slight	
69	Rain or drizzle and snow, moderate or heavy	

ww = 70 - 79 Solid precipitation not in showers

70	Intermittent fall of snow-flakes	slight at time of observation
71	Continuous fall of snow-flakes	
72	Intermittent fall of snow-flakes	moderate at time of observation
73	Continuous fall of snow-flakes	
74	Intermittent fall of snow-flakes	heavy at time of observation
75	Continuous fall of snow-flakes	
76	Diamond dust (with or without fog)	
77	Snow grains (with or without fog)	
78	Isolated star-like crystals (with or without fog)	
79	Ice pellets	

ww = 80 - 99 Showery precipitation, or precipitation with current or recent thunderstorm

80	Rain shower(s), slight
81	Rain shower(s), moderate or heavy
82	Rain shower(s), violent

83	Shower(s) of rain and snow mixed, slight	
84	Shower(s) of rain and snow mixed, moderate or heavy	
85	Snow shower(s), slight	
86	Snow shower(s), moderate or heavy	
87	Shower(s) of snow pellets or small hail,	- slight with or without rain or rain and snow
88	mixed	- moderate or heavy
89	Shower(s) of hail**, with or without	- slight
	rain or rain and snow mixed, not	
90	associated with thunder	- moderate or heavy
91	Slight rain at time of observation	
92	Moderate or heavy rain at time of observation	
93	Slight snow, or rain and snow mixed	
	or hail** at time of observation	thunderstorm during the
94	Moderate or heavy snow, or rain,	preceding hour but not
	and snow	
	mixed or hail** at time of observation	at time of observation
95	Thunderstorm, slight or moderate, without hail**, but with rain and/or snow at time of observation	
96	Thunderstorm, slight or moderate with hail** at time of observation	
97	Thunderstorm, heavy, without hail**, but	Thunderstorm at time

	with rain and/or snow at time of observation	of observation
98	Thunderstorm combined with duststorm or sandstorm at time of observation	
99	Thunderstorm, heavy, with hail** at time of observation	

** Hail, small hail, snow pellets

4678

Weather (w'w') Group Code

QUALIFIER		**WEATHER PHENOMENA**		
INTENSITY ORPROX-IMITY	**DESCRIPTOR**	**PRECIPITATION**	**OBSCURATION**	**OTHER**
1	**2**	**3**	**4**	**5**
- Light	**MI** Shallow	**DZ** Drizzle	**BR** Mist	**PO** Well-Developed
Moderate+	**PR** Partial (covering part of the aero-drome)	**RA** Rain	**FG** Fog	Dust/Sand Whirls
Heavy (well-devel-oped in the case of dust/ sand whirls, dust devils and tornadoes /waterspouts	**BC** Patches	**SN** Snow	**FU** Smoke	**SQ** Squalls
VC In the Vi-cinity	**DR** Low Drifting	**SG** Snow Grains	**VA** Volcanic Ash	**FC** Funnel cloud(s) (Tornado or Waterspout)
	BL Blowing	**IC** Ice Crystals (Dia-mond Dust)	**DU** Widespread Dust	**SS** Sandstorm
	SH Shower(s)	**PE** Ice Pellets	**SA** Sand	**DS** Duststorm
	TS Thunderstorm	**GR** Hail	**HZ** Haze	

QUALIFIER		WEATHER PHENOMENA		
INTENSITY ORPROX-IMITY	**DESCRIPTOR**	**PRECIPITATION**	**OBSCURATION**	**OTHER**
1	**2** **FZ** Freezing (Super-cooled)	**3** **GS** Small Hail and/ or Snow Pellets	**4** **PY** Spray	**5**

The w'w' groups will be constructed by considering columns 1 to 5 in the table above in sequence, that is intensity/proximity, followed by description, followed by weather phenomena. An example would be: +SHRA (heavy shower(s) of rain).

4900

Y Day of the week (UTC)

Code Figure

1 Sunday
2 Monday
3 Tuesday
4 Wednesday
5 Thursday
6 Friday
7 Saturday